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Main and trace element content of shales from Ankerskogen (Hamar) and Øvre Slottsgt. (Oslo), Norway

NGU
Norges geologiske undersøkelse
Geological Survey of Norway

Geological Survey of Norway
NO-7491 Trondheim, Norway
Tel.: 47 73 90 40 00
Telefax 47 73 92 16 20

REPORT

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Title:
Main and trace element content of shales from Ankerskogen (Hamar) and Øvre Slottsgt. (Oslo), Norway

Authors: Sæther, O. M., Xie, R., Aagaard, P., Endre, E., Løken, T. and Rudolph-Lund, K.	Client: Statsbygg
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Summary:
The composition of black and other shales within the Oslo Rift system may vary locally with respect to main and trace elements. Chemical analysis of major, minor and trace elements of one hundred Cambrian and Ordovician shale samples collected in Oslo and Hamar quantifies the variation in concentrations among the samples. In this report the concentration of elements determined by inductively coupled plasma atomic emission spectroscopy (ICP-AES) after digestion in strong acid, combustion assay with infrared detector (i.e. Leco stove), and x-ray fluorescence (XRF), is presented on samples from two locations in the Oslo Rift system. The data are presented in similar diagrams to those used by Broekmans and Sæther (2008) to facilitate comparison between shale samples from different localities. Data on mineralogical composition are assessed with respect to the role of sulfides and carbonates in forming gypsum and thus potentially causing swelling.

The samples from Ankerskogen are not typical "Black shales". By definition"Black shales" are dark-colored mudrocks containing organic matter and silt- and clay-sized mineral grains that accumulated together, and usually contain 1% or more organic carbons. Samples in Øvre Slottsgt. are typical black shales. They contain average organic carbon around 8-9%, with distinct black color due to the high content of organic carbon. The Ankerskogen samples indicate that clay minerals account for the largest fraction of the total mineral weight, spanning from 17% to 70% (excluding two samples of limestone nodules), with an average of around 53%. Quartz comes second, ranging from 9% to 45%, averaging about 24%.
The black shales from Øvre Slottsgt. contain illite/muscovite, lack chlorite, and represent a mineralogically very mature sediment. High concentrations of sulphur are found in these samples, with minimum of 2.38%, maximum of 7.96% and average of 5.47%. Semi-quantitation of the mineral content shows that quartz amounts to an average of 23% (excluding one sample containing limestone nodules) of all the mineral weight, clay (llite/muscovite) 45%, and pyrite 10%.

Calcite minerals in black shales together with iron sulfides can lead to the development of gypsum when sulphuric acid reacts with the calcite. Gypsum has lower density and can cause the expansion of shales. The conversion of iron sulfides to gypsum in situ has been suggested by Hagelia et al. (2003) as the mechanism leading to the swelling of alum shales in Oslo region. Gypsum was not found in any samples. This is most probably due to the fact that shales from these areas have not yet been exposed to oxidizing aquatic environment as they were freshly drilled and excavated.

Keywords: Black shale	Main elements	Trace elements
Oslo	Hamar	Whole rock geochemistry
Mineralogy	Swelling	

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1. INTRODUCTION

The composition of black shales within the Oslo Rift system may vary locally with respect to main and trace elements. Gautneb and Sæther (2009) have presented previously published geochemical data from twenty localities in the Oslo Rift, based among others on the work by Nyland & Teigland (1984). Information on the stratigraphy of the Cambro-Silurian sedimentary sequence in the Oslo Rift is found in Størmer (1953), Skjeseth (1958), Owen et al. (1990), and Dons (1997) in addition to the extensive geochemical assessment carried out by Bjørlykke (1974a and b).

In this report the concentration of elements determined by inductively coupled plasma atomic emission spectroscopy (ICP-AES) after digestion in strong acid, combustion assay with infrared detector (i.e. Leco stove), and x-ray fluorescence (XRF), is presented on samples from two locations in the Oslo Rift system. The data are presented in similar diagrams to those used by Broekmans and Sæther (2008) to facilitate comparison. Data on mineralogical composition are assessed with respect to the role of sulfides and carbonates in forming gypsum and thus potentially causing swelling.

2. ANALYTICAL METHODS

2.1 Origin of samples

The samples from the Ankerskogen recreational centre in the outskirts of Hamar (Fig.1a) are core samples from a nearly horizontal borehole drilled about perpendicular to strike from the north corner of the major building towards southeast. The samples are stratigraphically assumed to be Middle Ordovician of age (Elnes Formation; Stage 4a α 1-4) containing index fossils such as the graptolite *Didymograptus* and trilobite *Ogigyocaris* down to 130 m in core, where a Lower Ordovician *orthoceras* limestone (Stein Formation) was penetrated (Bockelie pers. comm. 2008). The core samples were split in half along the length axis before further preparation.

The samples from Øvre Slottsgt. 25 in the centre of Oslo (Fig. 1b) were collected from the surface of an underground outcrop in a newly excavated basement (Fig. 1c). The samples were collected at about one meter intervals in a section that is about 25 meters wide, strikes N-S, dips 20-25W, and constitutes black shales from the Upper Cambrian rocks of the Oslo Rift system containing the index fossil trilobite *Peltura* diagnostic of the Peltura-zone (Stage 2d α – δ) (Dons 1997, Bockelie pers. comm. 2008). A carbonate concretion was sampled about twenty meters from the S end of the section for reference (identified as “REFERENCE” in APPENDIX 4).

The black shales of the Oslo area consist of very fine grained material with a typical grain size below 50 µm. The material is typically very fragile and easily disintegrates into a particulate material with 5-50 mm fragments (Broekmans and Sæther 2008).

The representativeness of the collected samples might also be a problem with respect to content of potentially toxic trace components and geotechnical stability over time in contact with groundwater or concrete foundations. The representativeness with respect to the content of thirty acid extractable and seventeen whole rock chemical elements and eleven oxides is addressed in this report.

2.2 Sample preparation and geochemical analyses

Adequate amounts of random black shale fragments were initially comminuted in an iron mortar and pestle, then homogenized and split to ~35g in an horizontally positioned, agate-lined vibratory disc-mill for final pulverization.

An instrument which measures the chemical content of all chemical elements of the periodic table in a rock sample has still to be invented. Therefore a rock sample has to be subjected to an analytical program involving different instruments and analytical methods.

Loss On Ignition (LOI): LOI is determined gravimetrically by weighing before and after ignition at 1000 ˚C. LOI is made of contributions from volatile compounds (H_2O, CO_2, F, Cl and S) and added compounds (oxidation, e.g. FeO to Fe_2O_3). Samples after LOI analysis can be used for making fused glass discs.

Major elements: Fused glass disk is used for analyses of major elements. It is produced using 0.4500 grams of pre-ignited sample powder mixed with 4.0500 grams of Spectroflux® 100 (Lithium tetraborate). The flux-sample mixture is fused in a Pt - 5% Au crucible mounted on a Perl'X 3 machine with temperature set at 1150 ˚C. The resulting fusion glass discs are analyzed by X-Ray Fluorescence (XRF) for Al_2O_3, CaO, K_2O, MgO, MnO, Na_2O, SiO_2, total-Fe_2O_3, TiO_2, and P_2O_5.

Trace elements and sulfur: Pressed powder pellets are used for trace elements and sulfur analyses. They are produced by blending 10 grams of powder samples and 2 ml of paraloid solution (purely organic compound of Methy - butyl methacrylate) in an agate mortar. The mixture is pressed in a 40 mm stainless steel pellet - die at 20 tons in a hydraulic press to make a pressed pellet of the sample. The pellet has to be heated at temperature of 80 ˚C for ca. 1 hour to make it hard. The pressed powder pellets are then analyzed by XRF for Ba, Co, Cr, Cu, Nb, Ni, Pb, Rb, Sr, Th, U, V, Y, Zn, Zr and S.

Total carbon (TC) and total organic carbon (TOC): TC and TOC are determined using a LECO® stove with IR-detector. To remove inorganic carbon in the form of carbonates, hydrochloric acid is added to the samples. The samples are then rinsed with distilled water and dried. Total inorganic carbon (TIC) is, as an approximation, calculated by subtracting TOC from TC. The sample material is heated in an oxidizing atmosphere until 1350 °C, and the concentration of the released CO_2 is measured.

Acid extracted elemental analysis: A separate amount of powder (1 gram) was dissolved in excess (20mL) 7N HNO_3 by autoclaving in a microwave. Subsequently, the solution was evaporated and redissolved in dilute nitric acid. Concentrated nitric acid at 7N strength is a strong and oxidizing acid that readily dissolves many minerals, including sulfides and carbonates. In contrast, silicate minerals are incongruently dissolved essentially leaving a silica framework, whereas quartz dissolves hardly at all.

After digestion of each sample, the final solution were analyzed by Perkin-Elmer Optima 4300DV inductively coupled plasma spectrometer with atomic emission detector (ICP-AES) for the elements Si, Al, Fe, Ti, Mg, Ca, Na, K, Mn, Cu, Zn, Pb, Ni, Co, V, Mo, Cd, Cr, Ba, Sr, Zr, B, Be, Li, Sc, Ce, La, Y, and As (APPENDIX 2). Statistical data are tabulated in Tab. 2 and 3a-c.

2.3 Data presentation and assessment

Data have been collated in a spreadsheet using standard Microsoft Office Excel® software, 2007 edition. The cumulative frequency distribution curves and xy-diagram-diagrams were produced after converting data in the spreadsheet to a txt-file using Data Analysis System (DAS®) (Dutter et al. 1992), triangular plots were produced using software Petrograph® (Petrelli 1995), and scattergraphs were constructed by using Excel (APPENDIX 1). Tables with statistical data are presented in APPENDIX 2. The analytical results and derived parameters are tabulated in a main table in APPENDIX 3, based on the sample list and the reported results from Leco (S, C, TOC) and ICP-AES produced at Geological Survey of Norway (NGU) followed by data on XRF, Leco (C, TOC) and x-ray diffraction (XRD) from University of Oslo (UiO) (APPENDIX 4). All analytical values reported from the laboratory as “less than the detection limit” are set equal to “half of the detection limit” in APPENDIX 3 to facilitate processing of figures and tables in APPENDIX 1 and APPENDIX 2, respectively.

The concentrations of 18 selected main and trace elements determined by ICP-AES and TOC, TIC, C, and S determined using Leco stove, are plotted as cumulative frequency distribution curves, one for each element, and then the concentration of 18 selected elements are plotted versus TOC, S, and TIC in XY-diagrams with logarithmic axes, first set for samples from Ankerskogen (Figs. 3, 4, 5), and the second set for samples from Øvre Slottsgt. (Figs. 6, 7, 8). A third set with cumulative frequency distribution curves for samples from both locations are presented for direct comparison (Fig. 9, 10).

The concentrations of 11 main oxides plus data on loss on ignition (LOI) and 16 trace elements including S from XRF, are presented as cumulative frequency distribution curves, one for each including samples from both localities (Figs. 11, 12). The following three anomalous samples: ANK88 and ANK89 (uncertain quality and depth unknown) from Ankerskogen and SLO20 (used as a reference from) from Øvre Slottsgt. are not included.

Main element oxides by XRF are compared with data on the same elements by ICP-AES. This is done by presenting cumulative frequency distribution curves for the ratio (in percent) between equivalent oxide in each sample recalculated from the elemental content determined by ICP-AES versus the amount of the same oxide determined by XRF for 10 element oxides (Fig. 13) and thereafter the direct ratio (in percent) between 10 trace elements determined by ICP-AES and XRF (Fig. 14).

Triangular diagrams illustrating the relative proportion of selected main oxides and trace elements are presented in Figs. 15-22 and scattergraphs of metallic and lithophile elements from a subset of seven and five samples, respectively, are presented in Fig. 23.

The concentrations of 18 selected main and trace elements determined by ICP-AES and TOC, TIC, C, and S determined using Leco stove, are plotted towards distance from the first sampling startpoint (Figs. 24 and 25).

2.4 Variation among duplicates

The results of S, C, TOC, and TIC from NGU and UiO can be compared in diagrams presented in Fig. 2. The results are very consistent, in spite of S having been analyzed by using different methods. The results from NGU are used throughout the rest of the report.

The conversion factors used for calculating the equivalent weight oxide from a given element concentration (Table 1) are taken from Weast (1987). Statistical characteristics for the five duplicate samples labelled “REFERENCE” is tabulated in Table 2 (derived from APPENDIX 3).

The results of the "whole-rock" analysis by XRF and data from ICP-AES on the same elements converted to the form of oxides are listed in Table 3 together with data on S and results of "Loss-on-ignition" (LOI) at 1000°C. The sum of the oxides from XRF including the two latter parameters is 90-100% (91.92-99.53%). The ratio between the amount of an oxide extracted by 7N HNO_3 and determined by ICP-AES and the "total" amount as determined by XRF is tabulated after the XRF-determined trace elements (in ppm). The HNO_3-extractable portion is low for SiO_2 and TiO_2, (<1%), medium for Al_2O_3, MgO, MnO, Na_2O and K_2O (≈10-50%), and high for Fe_2O_3 and P_2O_5 (and MnO) (>80%).

3. RESULTS

3.1 Ankerskogen

3.1.1 Cumulative frequency distribution curves for 18 selected main and trace elements

The statistical parameters for samples from Ankerskogen are presented in Table 3.

The cumulative frequency distribution of the elemental concentration of Al, Ba, Fe, Mg, Ca, K, Mn, Cu, Zn, Pb, Ni, V, Mo, Cd, Cr, Sr, Li, and As (all in ppm=mg/kg) as determined by ICP-AES are presented in Fig. 3. Based on these diagrams the following general trends are observed:

There is a break in the concentration curve for Zn separating out the seven to nine samples with the highest concentrations. This could suggest that Zn is present in another form than as a trace element in Fe-sulfides, which presumably is the main form of S in these samples.

A similar trend is evident for Cd, with ten samples containing significantly higher concentration, than the majority of the samples, which all are below the detection limit of 0.1 mg/kg.

The concentrations of Cu and Ni, follow a similar frequency distribution in that five or six samples show the lowest concentrations, and the majority of the samples lie as one subset just below (for Cu) or above 100 mg/kg (for Ni).

The concentration distributions for Pb and V exhibit a similar shape, except that V has three samples isolated in the lower concentrations ranges. The concentration levels for majority of the samples is off-set compared with the concentration levels for Cu and Ni, towards lower concentrations for Pb (MED_{Pb} about 10 mg/kg) and below 100 mg/kg for V (MED_V about 60 mg/kg).

For Mo, Cd, and As the cumulative distribution shows that 75%-90% of the samples have concentrations below the detection limit. The cumulative frequency distribution of As indicates two possible modes of occurrence.

3.1.2 Cumulative frequency distribution curves for S, C, TOC, and TIC

The content of TOC (wt.%) in most of the samples follow a unimodal distribution ranging from about 0.2 wt.% to the maximum value of about 3wt.% (Fig. 4). This sample set is not assumed to be part of the alum shale section among the black shales in the Oslo Rift system. The cumulative frequency distribution of the concentrations of TIC presumably reflect the weight percent of graphite and carbonate minerals, which ranges between 0.3 and c. 10%. The total carbon content C seems to follow a bimodal distribution reflecting its division between mainly TOC and mainly TIC at about 2 wt.%.

The concentrations of S goes down to 0.01 wt.% and do not exceed 2 wt.% in these shale samples, with a median value of 0.5 wt.%. A break in the curve for the several samples with the highest concentrations of S, i.e. above 1.5 wt.%, could indicate two or more sulfide minerals being present.

3.1.3 XY- diagrams of selected elements versus TOC, S, and TIC

The TIC-content of the samples is not directly related with the TOC-content, although an overall, weak inverse trend is observed, as is the case for S versus TIC in the samples (Fig. 5a). The content of TOC in the samples does not seem to correlate strongly with the content of S, but again an overall, weak positive correlation is obvious.

There is a positive correlation between TOC and Pb, but also between TOC and K, Cu, Zn, Cd, and As.

A weak inverse relationship seem to exist between TOC and Al, Mg, Mn, V, Cr, and Li. For the other elements plotted no distinct trends are detectable with respect to TOC.

A strong positive correlation is evident for S versus Pb and As, and to a certain extent (many samples are below detection limit) also for S versus Mo and Cd. A weak negative correlation with respect to S versus Al, Fe, Mg, Ca, Mn, Cu, V, Sr, and Li seem to be the case for a subset of the samples from Ankerskogen.

A strong positive correlation is evident between TIC and Ca, Mn, and Sr (Fig. 5h, i, j). A weak negative correlation is evident between TIC and Zn, Pb, Ni, and V.

3.2 Øvre Slottsgt

3.2.1 Cumulative frequency distribution curves for 18 selected main and trace elements

The statistical parameters for samples from Øvre Slottsgt. are presented in Table 3.

The cumulative frequency distribution of the elemental concentration of Al, Ba, Fe, Mg, Ca, K, Mn, Cu, Zn, Pb, Ni, V, Mo, Cd, Cr, Sr, Li, and As (all in ppm=mg/kg) as determined by ICP-AES are presented in Fig. 6. Based on these diagrams the following general trends are observed:

The cumulative distribution of Al and K is virtually a mirror image of each other with similar overall shape and breaks, reflecting their residence in Al-silicates such as clay minerals, e.g. illites. Iron exhibits a similar trend as Al and K, with one sample (SLO7) having the lowest concentration.

Manganese (Mn) concentrations show a characteristic break in the frequency distribution curve similarly to Mg, Zn, Cd, and Sr, suggesting that Mn may reside in carbonate minerals as well as in Al-silicates (confer also biplots of Mg-TIC, Ca-TIC, Mn-TIC, and Sr-TIC).

The break in the concentration curve for Zn separating out the seven samples with the highest concentrations, could suggest that Zn is present in another form than as a trace element in Fe-sulfides, which presumably is the main form of S in these samples.

A similar trend is evident for Cd, with seven samples containing significantly higher concentrations, than the majority of the samples.

The Sr concentration in the samples shows a similar trend as that exhibited by Cd for a subset of the samples.

The concentrations of As, Cu, Mo, and Ni, follow a similar frequency distribution in that one or two samples show the lowest concentrations, and the majority of the samples lie as one subset just below (for As) or above 100-200mg/kg (for the three other elements). The concentration distributions for Pb and V exhibit a similar shape but is off-set, for Pb towards concentrations lower than 100mg/kg, whereas for V, towards concentrations higher than those for As, Cu, Mo, and Ni.

3.2.2 Cumulative frequency distribution curves S, C, TOC, and TIC determined by Leco

The concentration of S is below 8 wt.% in these black shale samples, with a median value of 5.5 wt.% (Fig. 7). A break in the curve for the four samples with the highest concentrations of S could indicate two or more sulfide minerals being present, but there are too few samples in the higher concentrations to conclude so with high certainty.

The content of TOC (wt.%) in most of the samples follow a unimodal distribution ranging from over 9% to the maximum value of 12.44%. This is assumed to be the alum shale part of the Cambrian-Ordovician shales. Three samples have TOC around 8%. The cumulative frequency distribution of the concentrations of TIC presumably reflect the weight percent of graphite and carbonate minerals, and ranges between 0.15 and 6.46 wt.%. The total carbon content C seems to follow a unimodal distribution but is, as mentioned above, divided between TOC and TIC.

3.2.3 XY-diagrams of selected elements versus TOC, S, and TIC

The TIC-content of the samples (Fig.8) is inversely related with the TOC-content A weak or strong positive correlation is evident between TIC and Ba, Mg, Ca, Mn, and Sr. For the other elements plotted in XY-diagrams versus TOC, no distinct trends are detectable with respect to the content of TOC.

The content of TOC in the samples does not seem to correlate strongly with the content of S. However, a weak correlation with respect to S seem to be the case for subsets of Fe, Cu, Zn, Pb, Ni, V, Mo, Cd, and As.

The content of S in the samples is weakly inversely related to the content of TIC, as is the concentrations of Al, Fe, K, Cu, Pb, Ni, V, Mo, Cd, and As versus the TIC-content.

A weak negative correlation is observed between TIC and Al, Fe, K, Cu, Zn, Pb, Ni, V, Mo, Cd, Cr, and As.

3.3 Ankerskogen versus Øvre Slottsgt

3.3.1 Cumulative frequency distribution curves for 18 selected main and trace elements (ICP-AES)

A comparison between the concentration of selected elements as determined by ICP-AES in Ankerskogen -samples and Øvre Slottsgt.-samples have been presented in cumulative frequency distribution curves and XY-diagrams with respect to TOC, S, and TIC for the same selected variables and plotted in common diagrams.

The TOC content of shale samples from Ankerskogen (<1 wt. %) are significantly lower than for those from Øvre Slottsgt. (about 10 wt.%). However, the concentration of Al is lower in samples from Ankerskogen compared to in those from Øvre Slottsgt., suggesting that there was a larger input of clastic sediments in the Ankerskogen area. This indicates that this locality was closer to clastic sources (more proximal) in the paleogeographic setting compared with Øvre Slottsgt. when they were deposited. Elements such as Ba, Mg, and Sr, related to biological activity, are also slightly higher in samples from Ankerskogen. However, the content of K, but also Fe, Ca, and B, are at the same levels in samples from both localities.

In the black shale samples from Øvre Slottsgt. trace elements associated with sulfides and non-oxic environments, e.g. As, Cd, Cu, Mn, Ni, Mo, Pb, V, and Zn, are found in higher concentrations than at Ankerskogen.

The concentration of Al is highest in samples from Ankerskogen and reflects a uniform distribution in various Al-silicates (eg. feldspars, chlinochlore, illite, muscovite) most of which are assumed to be introduced as clastic grains. There are four outliers with significantly lower Al-concentrations than other samples from the same locality. This could reflect samples dominated by limestone concretions.

The concentrations of Fe in shale samples from the two localities are on the same order of magnitude, and probably represents one mode of occurrence, or possibly two, e.g. pyrite and chlinochlore.

The concentrations of Mg are significantly higher in samples from Ankerskogen than in samples from Øvre Slottsgt. The Mg concentration distribution in samples from Øvre Slottsgt. may reflect Mg being part of detrital minerals introduced into a reducing organic rich environment.

The concentrations of both elements are at about the same level in samples from both locations. However, this could indicate that there are more carbonate minerals in Ankerskogen-samples. The K-content is higher in samples from Øvre Slottsgt. than in samples from Ankerskogen, indicating a higher weight percent detrital minerals, e.g. K-Feldspar, illite, muscovite in samples from Øvre Slottsgt.

Slightly higher Mn-concentrations is measured in samples from Ankerskogen compared with samples from Øvre Slottsgt., whereas the concentration of Cu show an opposite cumulative frequency distribution (Fig. 9b); samples from Øvre Slottsgt. have the highest content of Cu. A similar pattern is observed for Zn, Pb, V and, to a certain extent Ni, Ba, and Sr.

However, the elements Mo, Cd, As are present in samples from Øvre Slottsgt. with at least one order of magnitude higher concentrations than in samples from Ankerskogen. The major portion of these elements presumably reside in sulfides, i.e. pyrite, in samples from both localities.

3.3.2 Cumulative frequency distribution curves for S, C, TOC, and TIC

The sulfur (S)-content is about one order of magnitude higher in samples from Øvre Slottsgt. than in those from Ankerskogen (Fig.10). The S-concentration distribution in samples from Øvre Slottsgt. seem more homogeneous than the S-concentration distribution in samples from Ankerskogen, probably reflecting the detectable content of finely disseminated pyrite in all the samples from Øvre Slottsgt. If so this would suggest a more reducing depositional environment during formation of the shales at Øvre Slottsgt. Pyrite is not detectable in all samples from Ankerskogen, and the S-content varies over two orders of magnitude. Two or more forms of S-containing minerals, such as pyrite are likely to be present in samples from Ankerskogen.

The TOC-content is, as with S, about one order of magnitude higher in samples from Øvre Slottsgt. compared with in samples from Ankerskogen. This is reflected in the C-content, which is only slightly affected by the variation in TIC at both sites.

3.3.3 Cumulative frequency distribution of content of 11 main element oxides + LOI determined by XRF

The content of SiO_2, Al_2O_3, MnO, MgO, and Na_2O is somewhat higher in samples from Ankerskogen compared to in those from Øvre Slottsgt. However, the P_2O_5, BaO, and LOI and to a certain degree Fe_2O_3, is consistently higher in the samples from Øvre Slottsgt..

However, these sediments are not necessarily from the same stratigraphic level and are thus not directly comparable in view of sedimentological environment during their time of deposition.

3.3.4 Cumulative frequency distribution curves for 15 trace elements + S determined by XRF

The content of V_{xrf}, Co_{xrf}, Ni_{xrf}, Cu_{xrf}, Zn_{xrf}, Pb_{xrf}, Y_{xrf}, Nb_{xrf}, Th_{xrf}, U_{xrf}, Ba_{xrf}, and S_{xrf}, are all higher in samples from Ankerskogen compared with samples from Øvre Slottsgt. as can be seen from Fig. 12.

For Cr, and to a minor degree Rb and Zr, the samples from Ankerskogen have a higher content compared with samples from Øvre Slottsgt.

3.3.5 Cumulative frequency distribution curves for ratio between 10 main oxides concentrations made by ICP-AES and XRF

The differences in ratio between acid extractable oxide recalculated from elemental concentrations and total SiO_2, Al_2O_3, Fe_2O_3, CaO, K_2O, TiO_2 and P_2O_5 is constant at various concentration levels for samples from Ankerskogen and Øvre Slottsgt., and between 90% and 100% for Fe_2O_3 and CaO (Fig.13 and Tab. 3d). The difference in extraction ratios is not constant at various concentration levels for MnO, as it is about the same for samples from both localities at the lowest concentration ranges and increases with higher concentrations.

The cumulative frequency distribution curves for MgO-ratios is different from all the others when comparing samples from Ankerskogen and Øvre Slottsgt. in that it is low at lower extraction ratios in samples from Øvre Slottsgt., and increases towards those from Ankerskogen at higher extraction ratios.

The cumulative frequency distribution curves for Na_2O shows a trend which is opposite from that observed for the MgO-ratio, in that the samples from Ankerskogen show the lowest extraction ratios at the lower extraction ratios and approaches those in samples from Ankerskogen at higher extractions.

3.3.6 Cumulative frequency distribution curves for the ratio between 10 trace element concentrations made by ICP-AES and XRF

The minimum, medium, and maximum extraction percentages are listed in Table 3e and cdf curves are drawn in Figs. 14. The differences in extractability among the oxides are due to them being associated with different minerals in the shale samples, which are solubilized to different extent in strong acids.

For Co, Ni, Cu, Zn, and partially Pb and Sr, acid extractable amount of the element is the same samples from both localities. For V, Y and Zr a higher percentage is extractable in samples from Øvre Slottsgt., whereas for Cr it is opposite, - the largest amount is extractable in samples from Ankerskogen.

For Pb and Sr the percent extracted is lowest in the lower concentration ranges for samples from Ankerskogen, but these merge and coincide with the extraction percentages measured for samples from Øvre Slottsgt. at higher concentrations.

3.3.7 Triangular diagrams

The results of the chemical analysis of selected major, minor and trace elements are plotted in triangular diagrams (Figs. 15-22). These show the relative percentages within groups of three oxides/oxide sums/elements which add up to one hundred percent.

3.3.7.1 ($MgO+Fe_2O_3$ vs. Al_2O_3 vs. Na_2O+K_2O)-diagram

The triangular plot in Fig. 15 shows total alkalis as Na_2O+K_2O versus $MgO+Fe_2O_3$ (lower right) versus Al_2O_3 (on top). There is overall little separation between the samples from the two localities. Most, and about equal separation is shown with respect to the proportional amounts of $MgO+Fe_2O_3$.

The degree of salinity in depositional waters or variations in the content of illite or other mineral phases derived from K-feldspars are not factors reflected in the analyzed samples. However, the content of Mg- and Fe-containing minerals like Mg-containing carbonates and Fe-containing sulfides varies to a certain extent between the shale samples, and it varies over about the same range (30-45wt%) in samples from both localities. The samples may also contain traces of Mg- and Fe-containing silicates (e.g. biotites).

3.3.7.2 (MgO vs. CaO vs. Fe_2O_3)-diagram

The triangular plot in Fig. 16 shows MgO versus CaO on the lower right, versus total iron as Fe_2O_3 on top. The samples from Øvre Slottsgt. contain <10wt% MgO and plot close to the CaO-Fe_2O_3 –edge, whereas the samples from Ankerskogen contain higher concentrations of MgO and plot more towards the MgO corner, i.e. the center of the diagram. This reflects significant differences with respect to content of carbonates and sulfides (presumably the main host for Fe) in the samples.

3.3.7.3 (CaO vs. Al_2O_3 vs. Fe_2O_3)-diagram

The triangular plot in Fig. 17 shows total iron as Fe_2O_3 versus CaO at lower right, versus Al_2O_3 on top. The samples from Ankerskogen plot essentially in the same position as in the previous diagram with samples from Øvre Slottsgt. shifted more towards the Fe_2O_3 –corner.

Most of the separation between these three components in the two sample sets is based on relative differences in Al_2O_3 and Fe_2O_3.

3.3.7.4 (SiO_2 vs. CaO vs. 5 x Al_2O_3)-diagram

The triangular plot in Fig. 18 shows SiO_2 versus CaO on the lower right, versus total iron as $5xAl_2O_3$ It was plotted for comparing the content of these two sets of samples with those published by Turgeon and Brumsack (2006) and shows that most samples plot in the area of black shales, i. e. being clustered around 60% towards $5xAl_2O_3$ –corner close to the SiO_2-Al_2O_3 edge of the diagram.

3.3.7.5 Mn-V-As diagram

The triangular diagram in Fig. 19 show Mo versus V (lower right) versus As (at top). The samples from Ankerskogen are all clustered along the As-V edge close to the V corner. The samples from Øvre Slottsgt. have a higher content of Mo and plot closer to the center of the diagram, reflecting similar levels of As, but higher concentrations of Mo and lower concentrations of V than in samples from Ankerskogen.

3.3.7.6 Ni-V-Cr diagram

The triangular diagram in Figs. 20 show Ni versus V (lower right) versus Cr (at top). The triangular diagram shows that the samples from Ankerskogen plot close to the center of the triangle, somewhat towards the Ni-corner, whereas the samples from Øvre Slottsgt. are depleted in Cr and plot close to the Ni-V edge. There is a distinct separation of the samples in the two sets in the Ni-V-Cr triangular diagram.

3.3.7.7 Mn-Ba-Sr triangle

The triangular diagram in Figs. 21 show Mn versus Ba (lower right) versus Sr (at top).
The samples from Øvre Slottsgt. are scattered around the center of the triangle, whereas The samples from Ankerskogen are scattered around in the Mn corner. The samples from the two locations show a tendency towards separation into two subsets.

3.3.7.8 Zn-Cu-Pb triangle

The triangular plot in Fig. 22 shows Zn versus Cu (lower right) versus Pb (at top). The samples from Øvre Slottsgt. cluster around the center of the Zn-Cu axis, reflecting a low concentration of Pb. The samples from Ankerskogen are also relatively low in Pb and are clustered in a much larger area with a shift towards the Zr corner compared with the samples from Øvre Slottsgt. The two sets of samples overlap in the Zn-Cu-Pb triangular diagram.

3.3.8 Scattergraphs of selected trace elements from ICP-AES

The elements determined by ICP-AES in seven samples from Ankerskogen (every 10^{th}) and five from Øvre Slottsgt. (every 5^{th}) are plotted alphabetically in two groups: chalcophile elements (Ag As Ba Cd Co Cr Cu Mo Ni Pb V Zn) (Fig. 23a) and lithophile elements (B Be Ce La Li Sc Sr Y Zr) (Fig. 23b). Samples from both locations are easily distinguishable in such scattergraph giving them different "finger-prints" without any further geochemical relevance.

The pattern shown for the lithophile elements are similar at both locations except a higher amount of Ce and La in samples from Øvre Slottsgt. Among the chalcophile elements there is elevated amounts of As, Cu and especially Mo and V in samples from Øvre Slottsgt.

3.3.9 Concentration of selected elements versus depth

In samples from Ankerskogen, the elements U, K, Zn, Pb, Ni, V, Mo, Cd, Sr, and As are present in higher concentrations at around 110m depth in the borehole (Fig. 24a,b,c). This seems to coincide with a peak in S, but also elevated amounts of C.

At about 50 m depth, the concentration of some elements, e.g. U, Fe, Ca, K, Mn, Zn, Pb, V, Mo, Sr, and As, are slightly elevated. This coincides with higher concentrations of TIC.

All the samples from Øvre Slottsgt. have higher concentrations of the elements U, Cu, Zn, Pb, V, Mo, Cd, and As, compared with samples from Ankerskogen. The highest concentrations coincide with higher concentrations of S and TOC.

In general, the concentration level for each element in the samples from Øvre Slottsgt. is on the same order throughout the sampled section. However, variation between neighbouring samples spans, in some cases, the whole concentration range for the element.

3.4 Mineralogical composition

3.4.1 Ankerskogen

Most of the samples collected from Ankerskogen are not really samples of typical "Black shales" by definition (Vine and Tourtelot, 1970; Tourtelot 1979 and references therein) in which "Black shales" are defined as dark-colored mudrocks containing organic matter and silt- and clay-sized mineral grains that accumulated together, and usually contain 1% or more organic carbons. The samples from Ankerskogen samples are featured by low content of organic carbon (from 0.1 to 2.0%, with an average of 0.61) and hence light color (mostly grey).

As indicated in Fig. 26, these samples usually contain quartz (3.35 Å d-spacing), calcite (3.03 Å), chlorite (clinoclore) (7.1Å), illite (10.0 Å) and albite (3.20 Å). Quartz is characteristic of shale samples, with main XRD-peak at 3.35 Å. It is found in almost all of the samples (Appendix 4). Unlike the samples in Øvre Slottsgt., those in Ankerskogen contain quite some chlorite in the form of clinochlore. The enrichment of Mg, Ni and Cr compared to those in Øvre Slottsgt. is a strong indication of the presence of chlorite. Traces of pyrite (FeS_2) can be found in most of the samples. Sedimentary pyrite forms by the reaction of H_2S with detrital iron minerals. The H_2S is produced by bacterial sulfate reduction, a process which involves both the decomposition of organic matter and production of H_2S.

Semi-quantitation of the minerals have been performed by calculating the integrated peak area of respective mineral phases, multiplied by published weight factors **(**Peltonen et al. 2008 and references therein). The results indicate that clay minerals account for the largest fraction of the total mineral weight, spanning from 17% to 70% (excluding two samples of limestone nodules), with an average of around 53% (see Fig. 27). Quartz comes second, ranging from 9% to 45%, averaging about 24%. Pyrite is very low, mostly less than 2%.

The accuracy of the quantitation is checked by comparing the percentage of the chemical constituents calculated from the XRD mineral values with those from XRF. To calculate the chemical constituents from the minerals, some assumptions have to be made. For some minerals such as quartz, calcite, dolomite and pyrite, invariable formula for each mineral is assumed. They are defined as SiO_2, $CaCO_3$, $CaMg(CO_3)_2$, and FeS_2, respectively. Other minerals, such as chlorite, illite/muscovite, K-feldspar and albite, each has no unique chemical composition which makes the calculation complex. In this calculation, the empirical formula of chlorite is defined as $Mg_{3.75}Fe_{1.25}Si_3Al_2O_{10}(OH)_8$ (representing clinochlore as determined by XRD), illite as $K_{0.6}(H_3O)_{0.4}Al_{1.3}Mg_{0.3}Fe_{0.1}Si_{3.5}O_{10}(OH)_2(H_2O)$, muscovite as $KAl_3Si_3O_{10}(OH)_{1.8}F_{0.2}$, K-feldspar as $KAlSi_3O_8$ (orthoclase), and albite as $NaAlSi_3O_8$.

Fig. 28 shows the correlations of SiO_2, Al_2O_3 and CaO obtained from XRF between those calculated from XRD. The near unit regression lines and unit correlation coefficients suggest good agreement between XRF and XRD. However, FeO, MgO, K_2O and Na_2O are more scattering, deviating from ideal unit slopes and unit correlation coefficients. The reasons behind this are that: firstly, these minerals most likely contain variable chemical compositions and the assumed chemical formulas may not exactly represent the chemistry of the minerals, and secondly, there are uncertainties associated with the XRF and XRD analyses, especially the less sensitive XRD applied to samples containing these trace-level minerals.

3.4.2 Øvre Slottsgt.

Samples in Øvre Slottsgt. are typical black shales. They contain average organic carbon around 8-9%, with distinct black color due to the high content of organic carbon. Again, quartz is the dominant mineral which appears in every sample with the most intensive XRD reflection. The black shales contain illite/muscovite, lack chlorite (Fig. 29, 30), and represent a mineralogically very mature sediment. High concentrations of sulphur are found in these samples, with minimum of 2.38%, maximum of 7.96% and average of 5.47%. Semi-quantitation of the mineral content shows that quartz amounts to an average of 23% (excluding one sample containing limestone nodules) of all the mineral weight, clay (Illite/muscovite) 45%, and pyrite 10%.

Minor amounts of authigenic carbonate minerals, either dispersed in cements or in concretions, are characteristic feature of many black shales. These carbonates are mostly calcite limestones. Dolomite occurs only in small amounts or is absent in some of the samples, which is corroborated by XRF and LECO® results, where measured CaO by XRF and calculated CaO from inorganic carbon by LECO® method do correlate well (Fig. 31). This also agrees well with findings by Bjørlykke (1974b). Calcite minerals in black shales together with iron sulfides can lead to the development of gypsum. Gypsum has lower density and can cause the expansion of shales. The conversion of iron sulfides to gypsum in situ has been suggested by Hagelia et al. (2003) as the mechanism leading to the swelling of alum shales in Oslo region.

Gypsum was not found in any samples. This is most probably due to the fact that shales from these areas have not yet been exposed to oxidizing aquatic environment as they were freshly drilled and excavated.

4. CONCLUSIONS

Chemical analysis of major, minor and trace elements of one hundred Cambrian-Ordovician shale samples collected in Ankerskogen (Hamar) and Øvre Slottsgt (Oslo) quantifies the variation in concentrations among the samples.

The samples collected at each of the localities are significantly different from each other with respect to many elements analyzed. This is high-lighted by plotting the results of selected lithophile and chalcophile elements determined in a few selected samples from each of the two localities in scattergraphs similarly to what has been done for other black shales from the Oslo area (Broekmans and Sæther 2008). The scattergraphs may be used as a "fingerprint" when comparing shale samples from different localities.

By plotting the data in triangular diagrams, a classification method used in classifying metamorphosed shales, the samples fall into distinct categories. Some of the plots presented, e.g. Fig. 19 (Mn-V-As) and 20 (Ni-V-Cr), differentiate the samples better than others, and these can be recommended used in classifying shale samples from different locations.

The content of SiO_2, Al_2O_3, MnO, MgO, and Na_2O is somewhat higher in samples from Ankerskogen compared to in those from Øvre Slottsgt.. However, the P_2O_5, BaO, and LOI and to a certain degree Fe_2O_3, is consistently higher in the samples from Øvre Slottsgt..

The TOC content of shale samples from Ankerskogen (<1 wt. %) are significantly lower than for those from samples from Øvre Slottsgt. (about 10wt.%). The S-content is about one order of magnitude higher in samples from Øvre Slottsgt. than in those from Ankerskogen

The concentrations of elements such as Ba, Mg, and Sr, determined by ICP-AES are slightly higher in samples from Ankerskogen, whereas the content of K, but also Fe, Ca, and B, are at the same levels in samples from both localities. The samples from Øvre Slottsgt. have a higher content of the trace elements As, Cd, Cu, Mn, Ni, Mo, Pb, V, and Zn than what was found in the samples from Ankerskogen.

The content of V, Co, Ni, Cu, Zn, Pb, Y, Nb, Th, U, and Ba determined by x-ray fluorescence are all higher in samples from Ankerskogen compared with samples from Øvre Slottsgt..

Most of the samples collected from Ankerskogen are not really samples of typical "Black shale". The results indicate that clay minerals account for the largest fraction of the total mineral weight, spanning from 17% to 70% (excluding two samples of limestone nodules), with an average of around 53%. Quartz comes second, ranging from 9% to 45%, averaging about 24%. Pyrite is very low, mostly less than 2%.

Samples from Øvre Slottsgt. are typical black shales. They contain average organic carbon around 8-9 wt. %, and quartz is the dominant mineral with ubiquitous illite and no chlorite. The concentrations of sulfur are high in these samples with minimum 2.4 %, maximum 8.0 % and an average of 5.5 %. Recalculated to pyrite this amounts to 4.5, 15, and 10 %, respectively.

Minor amounts of authigenic carbonate minerals, either dispersed in interstitial cements or in concretions, are a characteristic feature of many black shales. Calcite minerals in black shales together with iron sulfides can lead to the development of gypsum when sulphuric acid reacts with the calcite. Gypsum has lower density and can cause expansion of the shales. The conversion of iron sulfides to gypsum in situ has been suggested by Hagelia et al. (2003) as the mechanism leading to swelling of alum shales in the Oslo region. In addition, many of the potentially toxic trace elements in black shales reside in sulfide mineral phases (Saether et al. 1984). When the sulfides disintegrate, the incorporated trace elements might be mobilized and become part of the aqueous environment.

5. REFERENCES

Broekmans, M. A. T. M. and Sæther, O. M. 2008. Chemical composition of black shale from four locations, greater Oslo area, Norway. NGU-report 2008.092, 37 p.

Bjørlykke, K. 1974a. Depositional history and geochemical composition of Lower Palaezoic epicontinental sediments from the Oslo region. Norges Geologiske Undersøkelse Bulletin, 305, 81 p.

Bjørlykke, K. 1974b. Geochemical and mineralogical influence of Ordovician Island Arcs on epicontinental clastic sedimentation. A study of Lower Palaeozoic sedimentation in the Oslo Region, Norway. Sedimentology 21 (2), p. 251-272.

Dons, J. A. 1997. Oslo-traktens geologi med 25 turbeskrivelser. Vett &Viten, 207 p.

Dutter, R., Leitner, T., Reimann, C. and Wuraer, F. 1992. Grafische und geostatistische Analyse am PC. Beitrage zur Umweltstatistik. Schriftreihe der Technischen Universitet Wien, Bd. 29: 78-88.

Hagelia, P. Sibbick, R. G. Crammond, N. J. and Larsen. C. K. 2003. Thaumasite and secondary calcite in some Norwegian concretes. Cement and concrete composites 25 (8), p. 1131 – 1140.

Nyland, B. & Teigland, J. 1984: Sedimentologisk og geokjemisk undersøkelse av de kambriske og underordoviciske marine sedimenter i Oslofeltet. Thesis for cand. real. Geologisk institutt, Universitetet i Oslo, 196 p.

Owen, A.W., Bruton, D.L., Bockelie, J.F., and Bockelie, T.G. 1990. The Ordovician succession of the Oslo region. NGU Special Publication 4, 54 p.

Peltonen, C. B., Marcussen, Ø., Bjørlykke, K., Jahren, J. 2008. Mineralogical control on mudstone compaction: a study of the Late Cretaceous to Early Tertiary mudstones of the Vøring and Møre Basins, Norwegian Sea. Petroleum Geoscience 14, vol. 2, p.127-138; DOI: 10.1144/1354-079308-758

Saether, O.M., Runnells, D.D., and Meglen, R.R. 1984. Trace and minor elements in Green River Oil Shale (Colorado, USA), concentrated by differential density centrifugation. Chemical Geology, 47 (1984/1985), p. 1-14.

Skjeseth, S. 1958. Uran i kambrisk alunskifer i Oslofeltet og tilgrensende områder, NGU bulletin. 203, p. 100-111.

Størmer, L. 1953. The Middle Ordovician of the Oslo Region, Norway. No. 1. Introduction to stratigraphy. Norsk Geologisk Tidsskrift 31, p. 37-141.

Tourtelot, H. A. 1979. Black shale - its deposition and diagenesis. Clays and Clay Minerals 27 (5) p. 313-321.

Turgeon, S. and Brumsack, H.-J. 2006. Anoxic vs dysoxic events reflected in sediment geochemistry during the Cenomanian-Turonian Boundary Event (Cretaceous) in the Umbria-Marche Basin of central Italy. Chemical Geology 234, p. 321-339.

Vine, J. D. and Tourtelot, E. B. 1970. Geochemistry of black shale deposits ¬- a summary report. Economic Geology 65 (3) p. 253-272; DOI: 10.2113/gsecongeo.65.3.253

Weast, R. C. (editor) 1987.Handbook of chemistry and physics. Section B: The elements and inorganic compounds. 68th edition. CRC Press, Boca Raton, FL 33431:B68-146.

6. APPENDIX 1:

FIGURES

Figure 1a: Map showing location of Ankerskogen recreational centre, Hamar (from telefonkatalogen.no\gulesider). Core was drilled southwards at low angle approximately perpendicular to bedding under the northeastern section of the building.

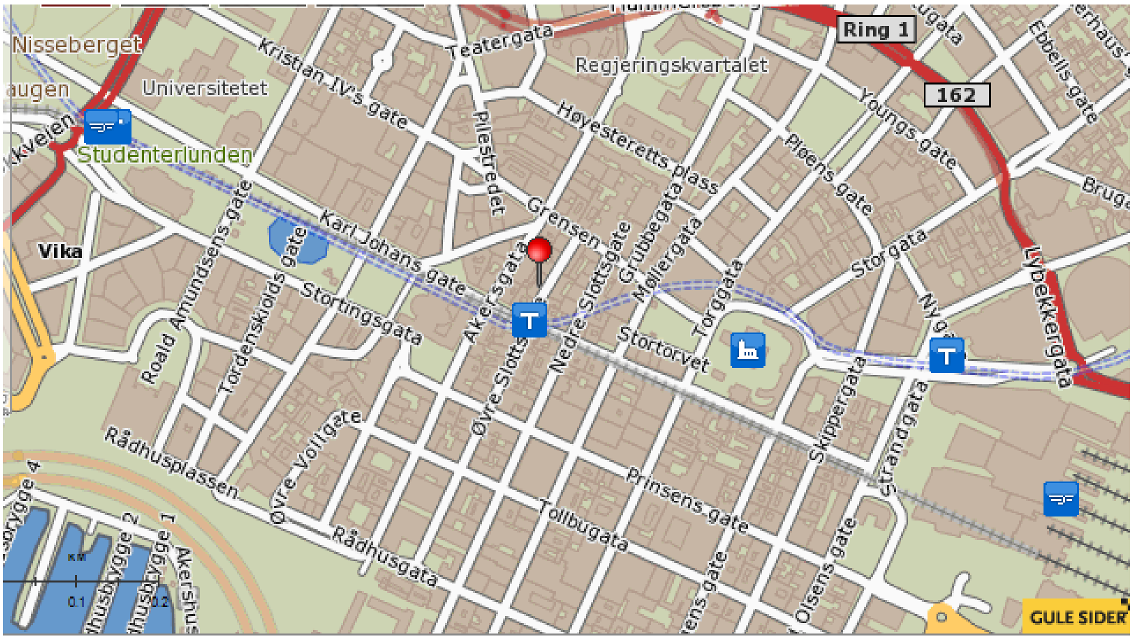

Figure 1b: Map showing location Øvre Slottsgt. in Oslo (from telefonkatalogen.no\gulesider). The samples were collected from SW to NE at 1m intervals in outcrop just below street level.

Fig. 1c. Samples from Øvre Slottsgt. 25 were collected about one meter above yellow measuring-tape with one meter intervals from far end towards the white plastic bag in the lower right. Total distance of section is 25 meters.

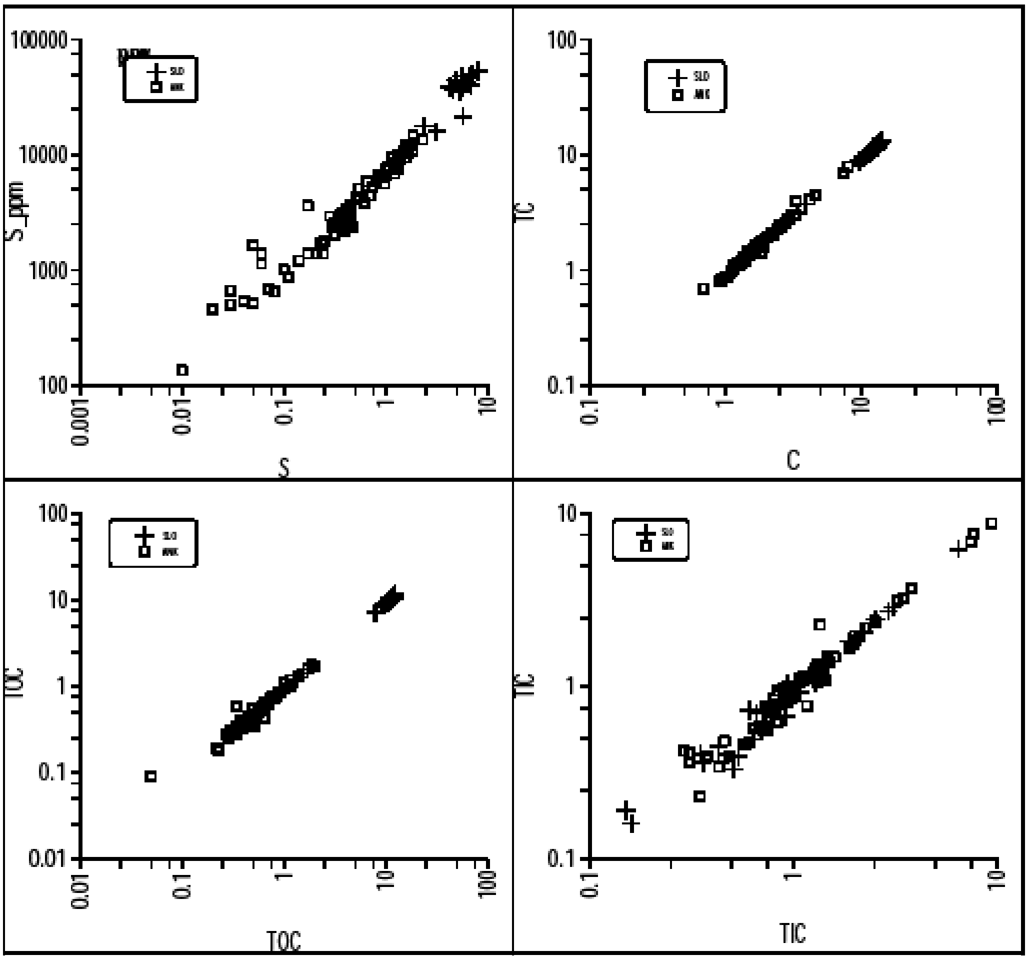

Figure 2: Diagram of showing concentrations (in %; ppm=mg/kg) of S, C, TOC and TIC(C-TOC) in all samples analyzed at NGU (along abscissa) versus the concentrations in the same samples analyzed at UiO (along ordinate).

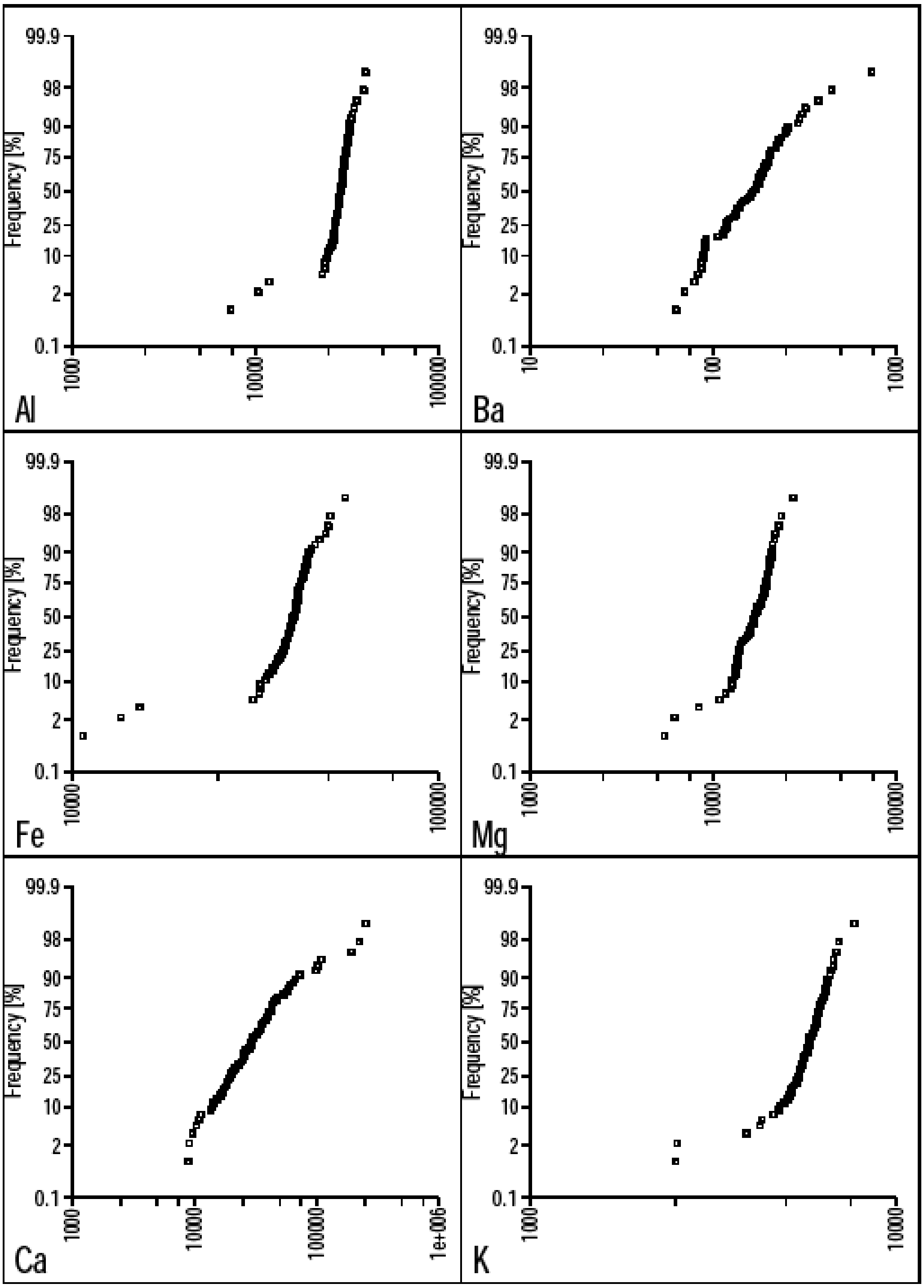

Figure 3a: Cumulative frequency distribution curves of concentrations (mg/kg) of Al, Ba, Fe, Mg, Ca, and K determined by ICP-AES in samples from Ankerskogen.

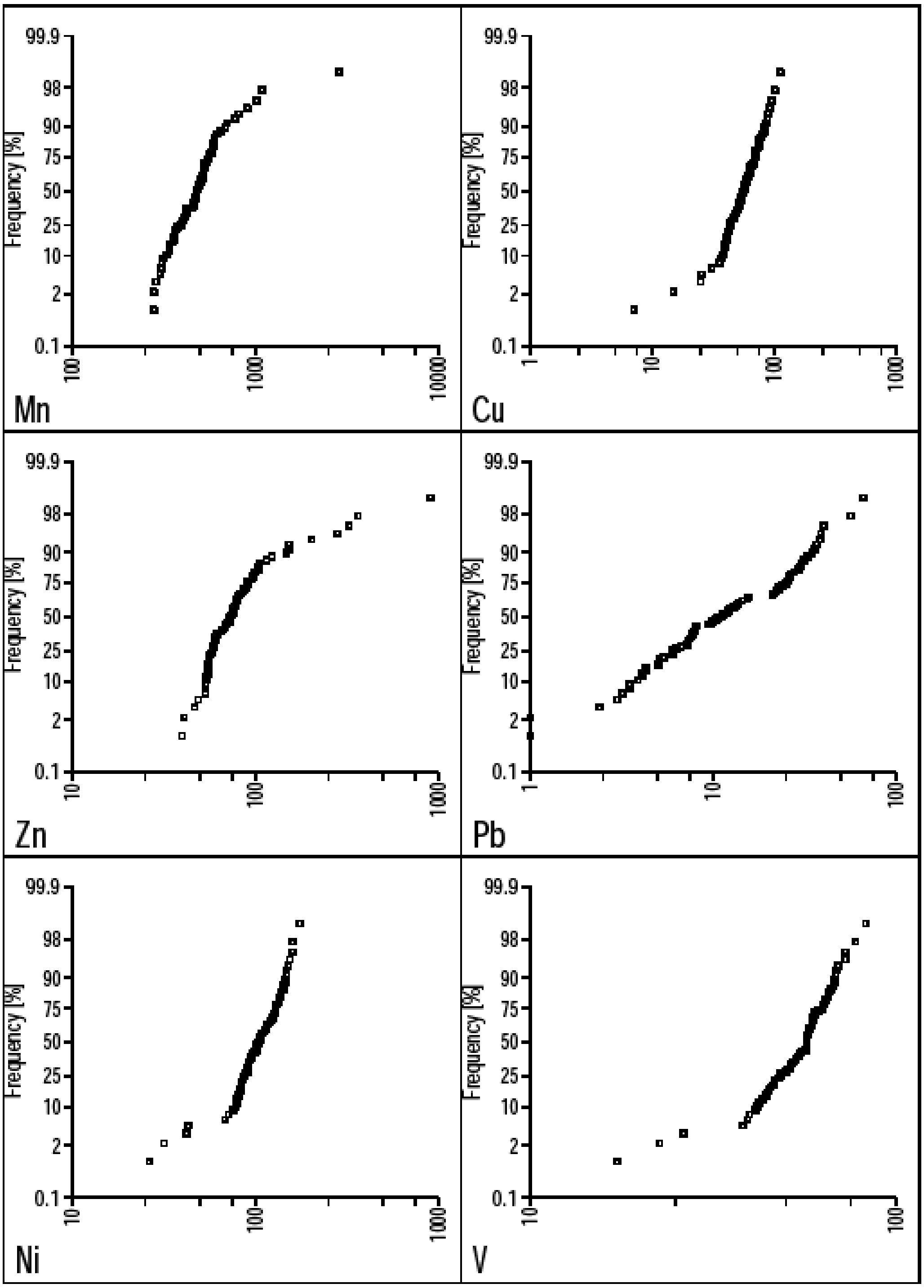

Figure 3b: Cumulative frequency distribution curves of concentrations (mg/kg) of Mn, Cu, Zn, Pb, Ni, and V determined by ICP-AES in samples from Ankerskogen.

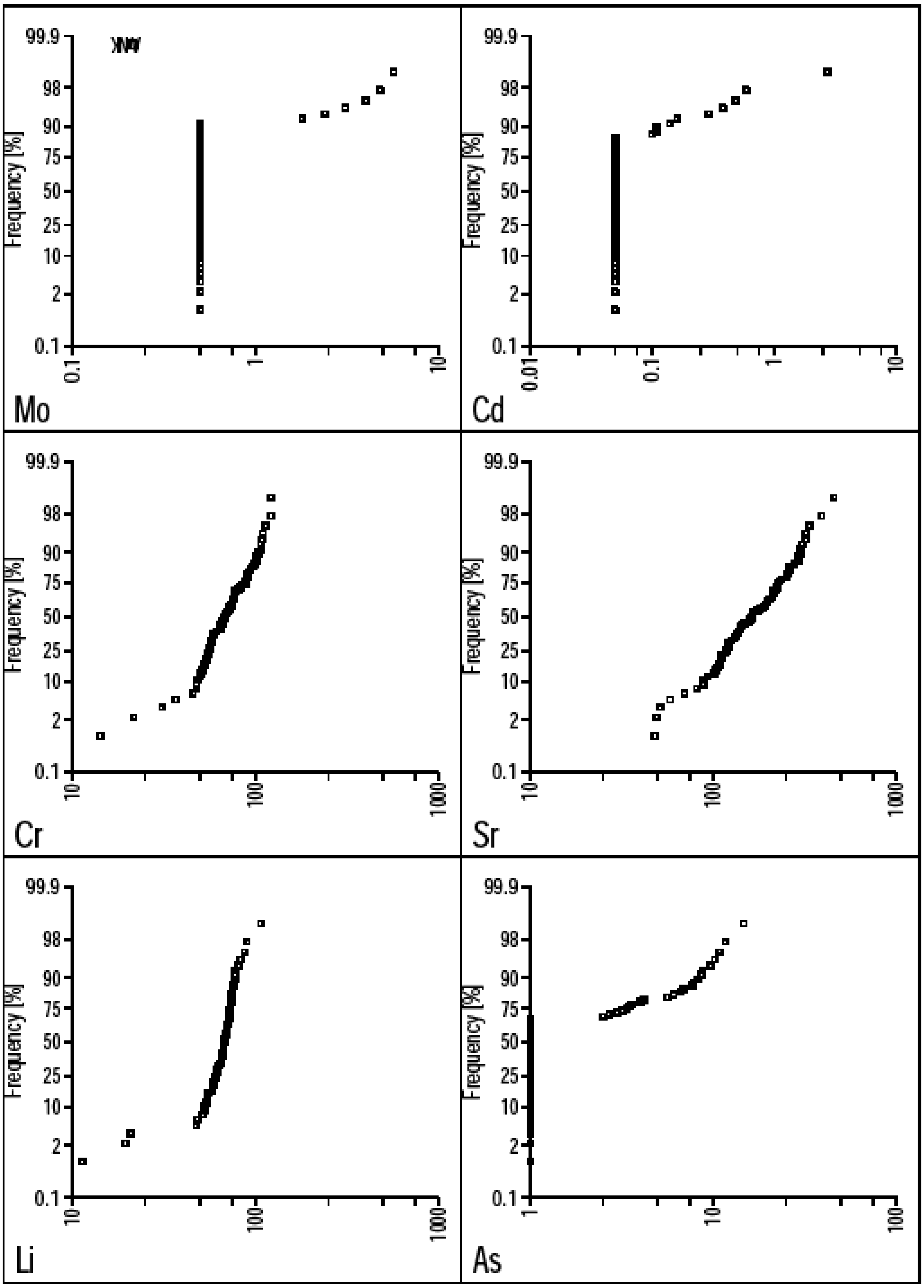

Figure 3c: Cumulative frequency distribution curves of concentrations (mg/kg) of Mo, Cd, Cr, Sr, Li, and As determined by ICP-AES in samples from Ankerskogen.

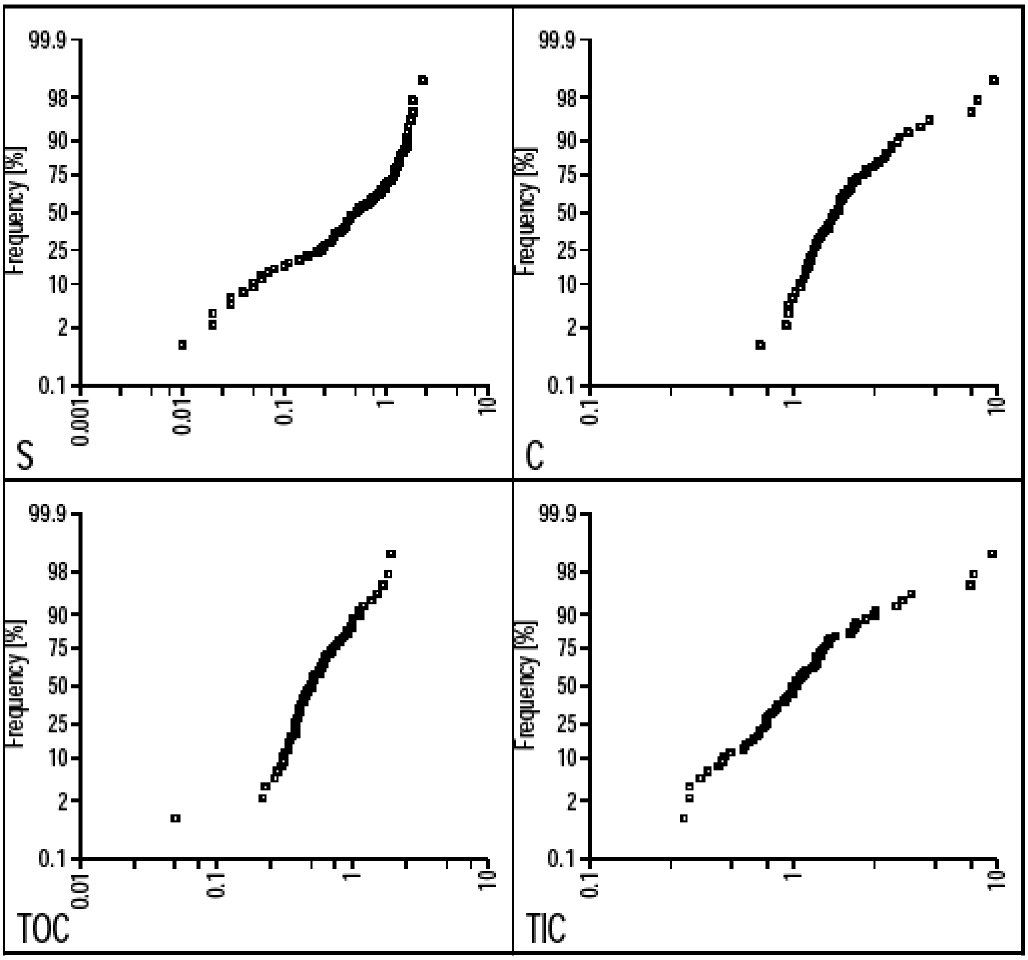

Figure 4: Cumulative frequency distribution curves of concentrations of S, C, TOC, and TIC (wt. %) determined using Leco stove in samples from Ankerskogen.

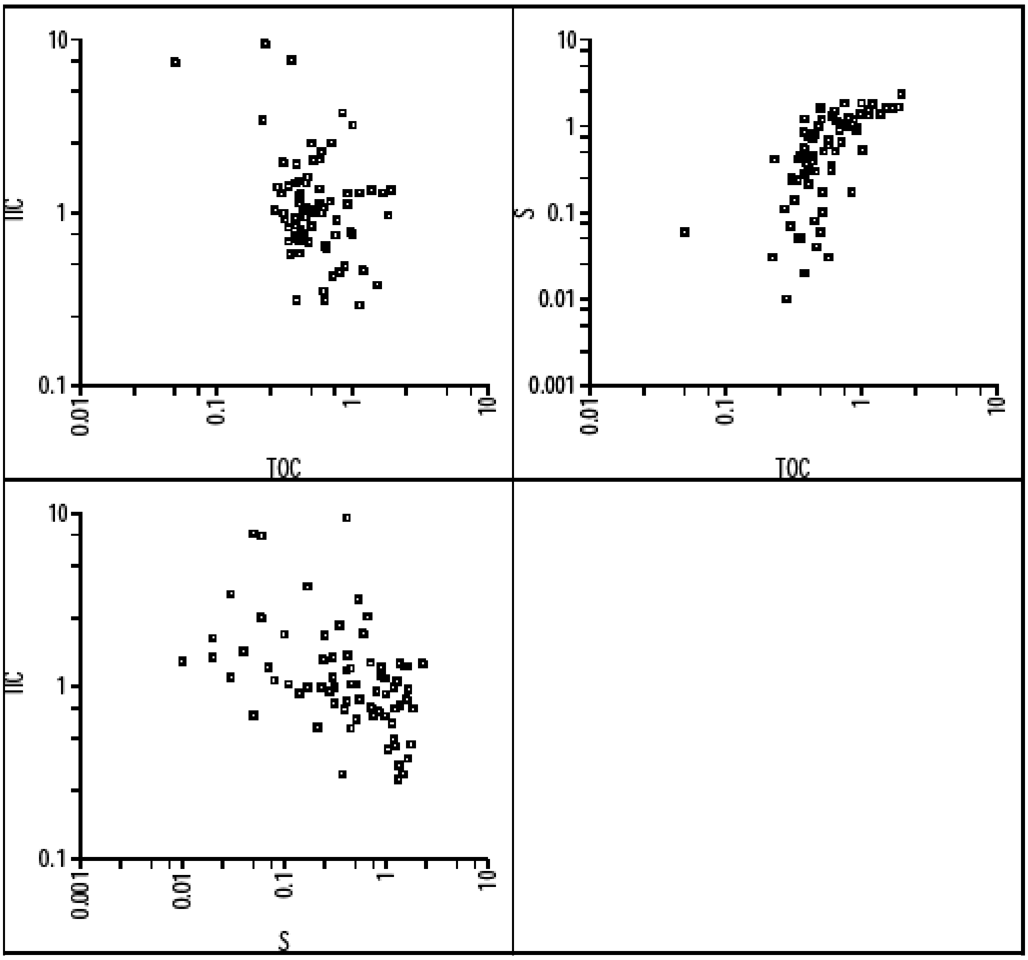

Figure 5a. XY-diagrams of samples from Ankerskogen of TOC, S, and TIC (wt. %) determined using Leco stove plotted against each other.

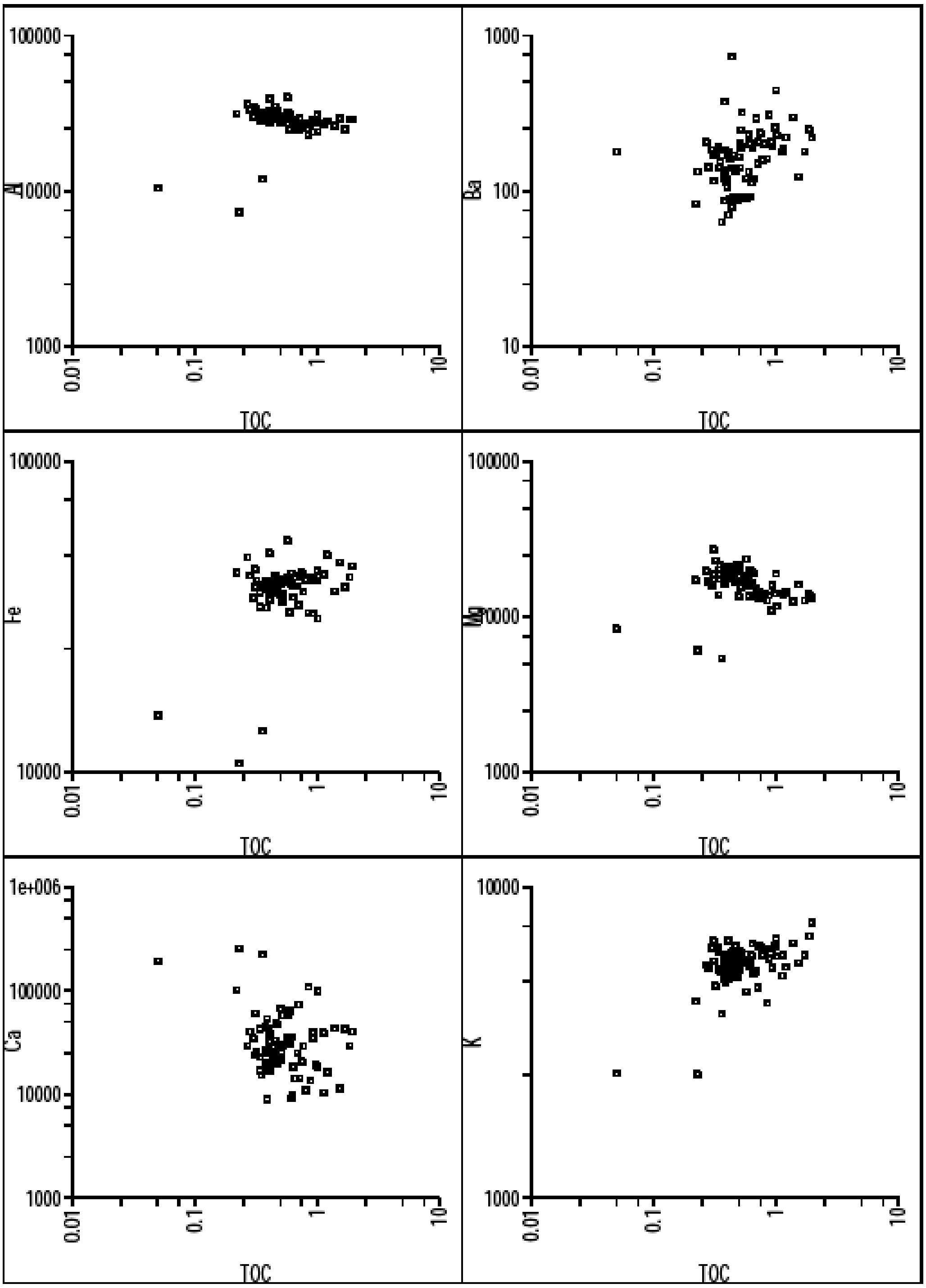

Figure 5b. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K(mg/kg) determined by ICP-AES plotted versus TOC(wt. %) in samples from Ankerskogen.

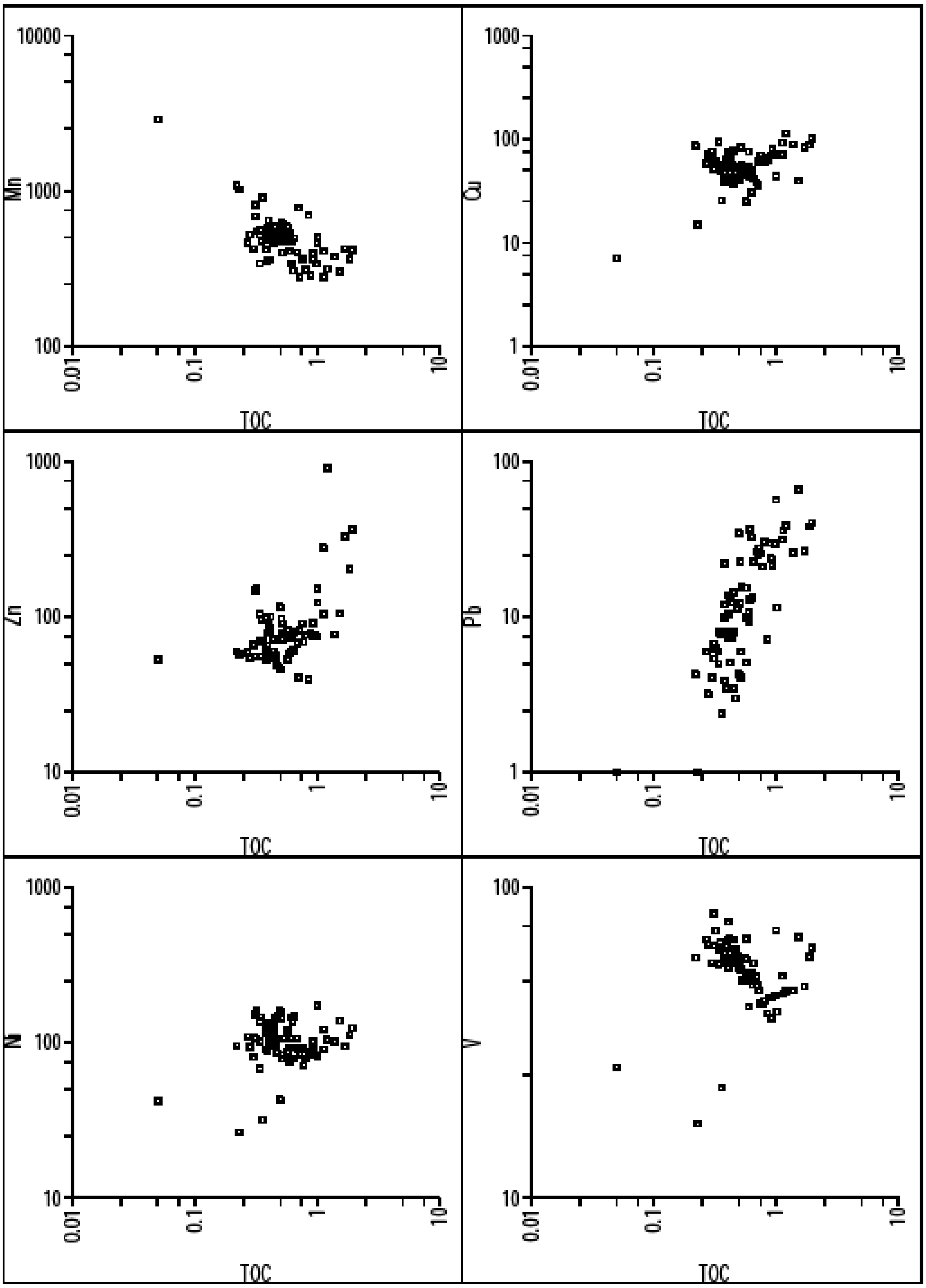

Figure 5c. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V(mg/kg) determined by ICP-AES plotted versus TOC(wt. %) in samples from Ankerskogen.

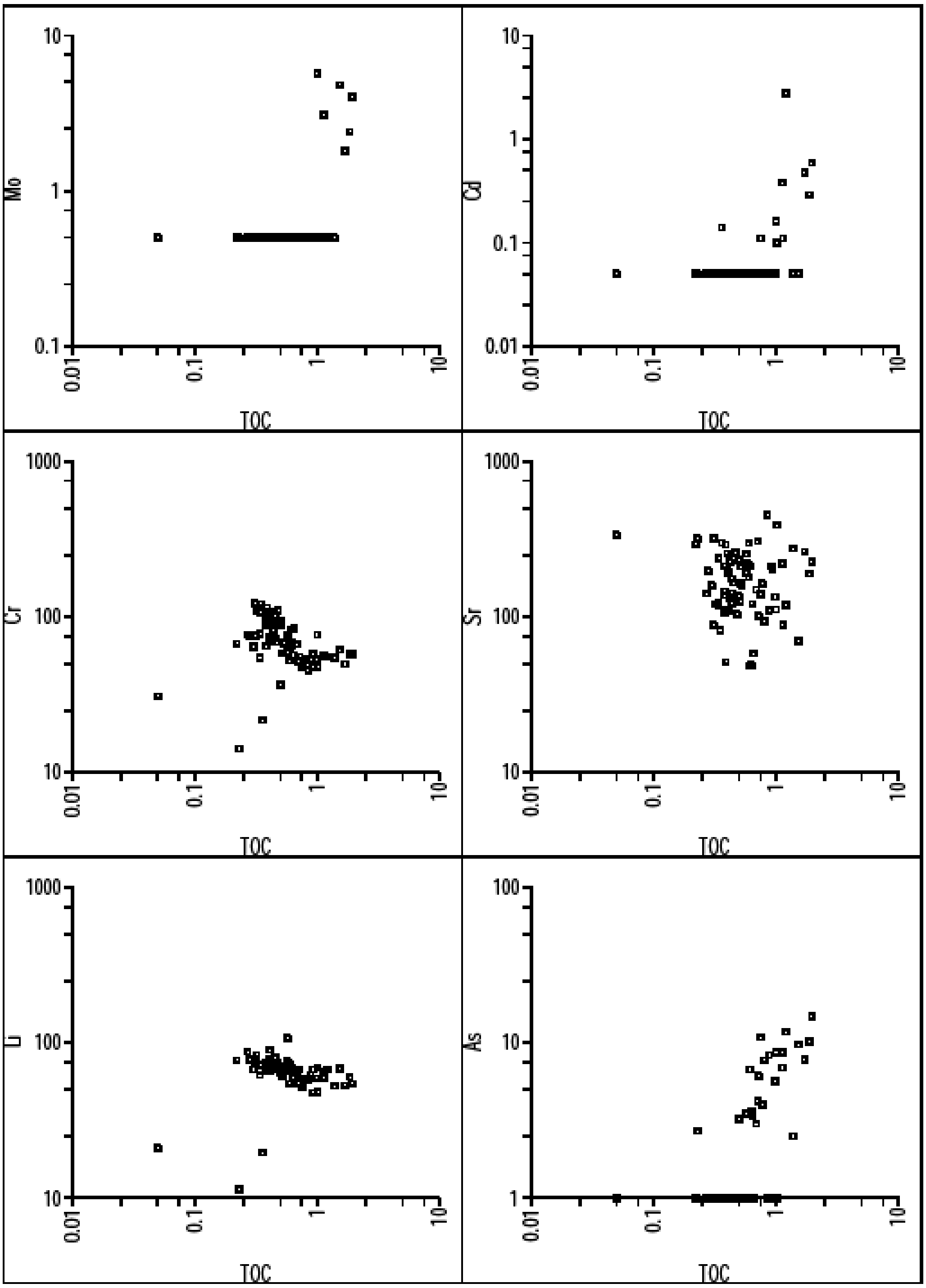

Figure 5d. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus TOC (wt. %) determined using Leco stove in samples from Ankerskogen.

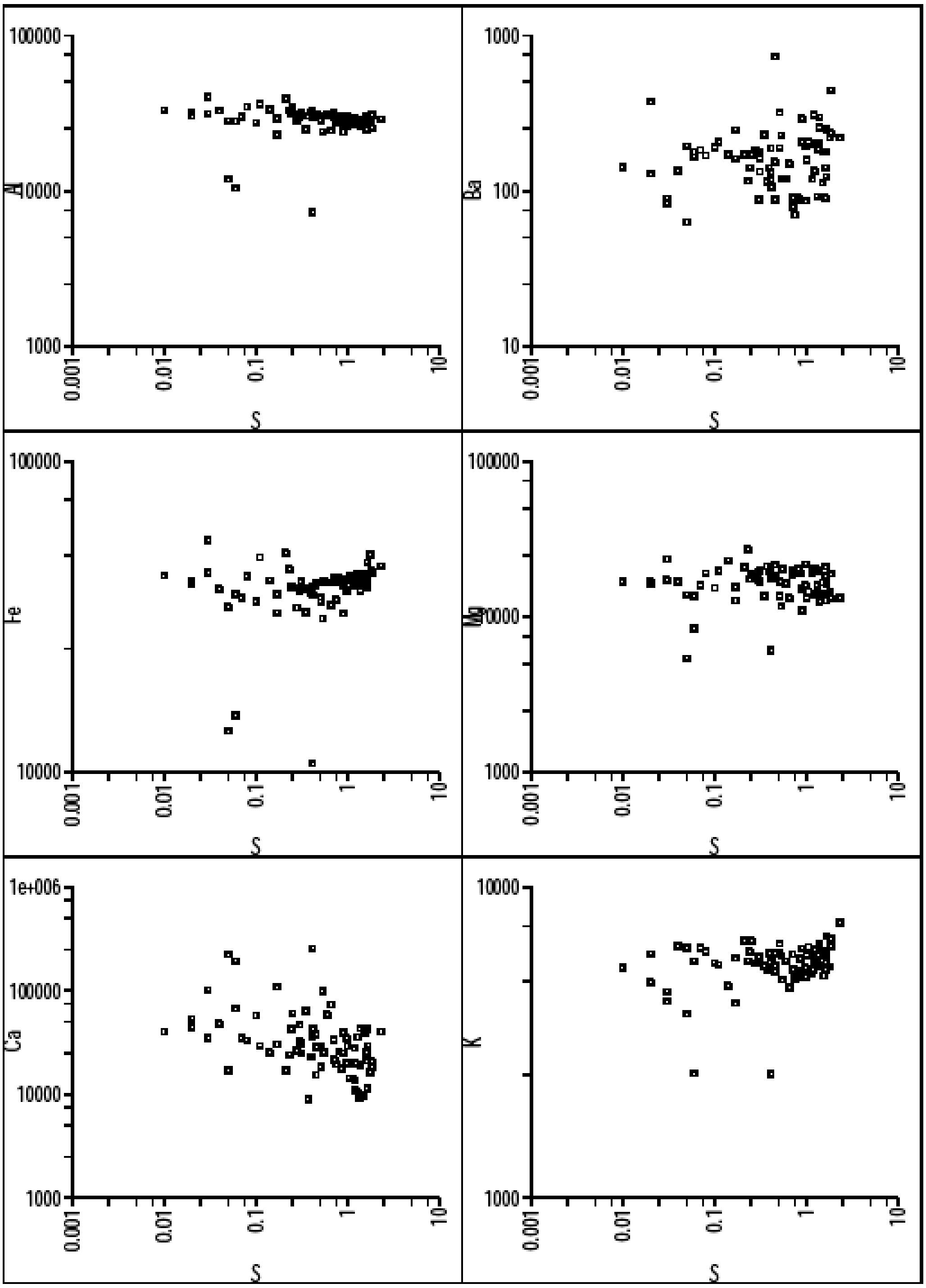

Figure 5e. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined by using Leco stove in samples from Ankerskogen.

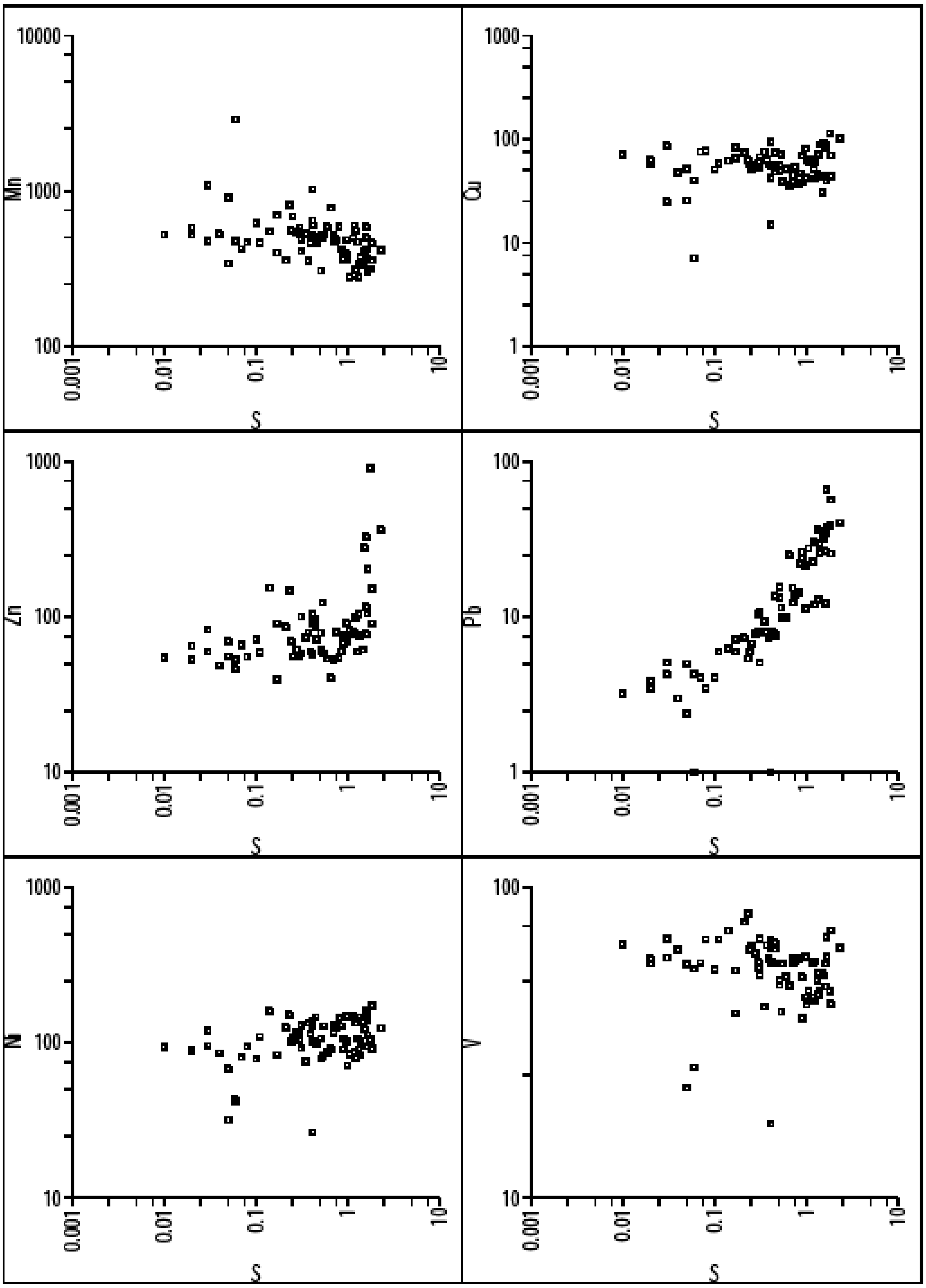

Figure 5f. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined using Leco stove in samples from Ankerskogen.

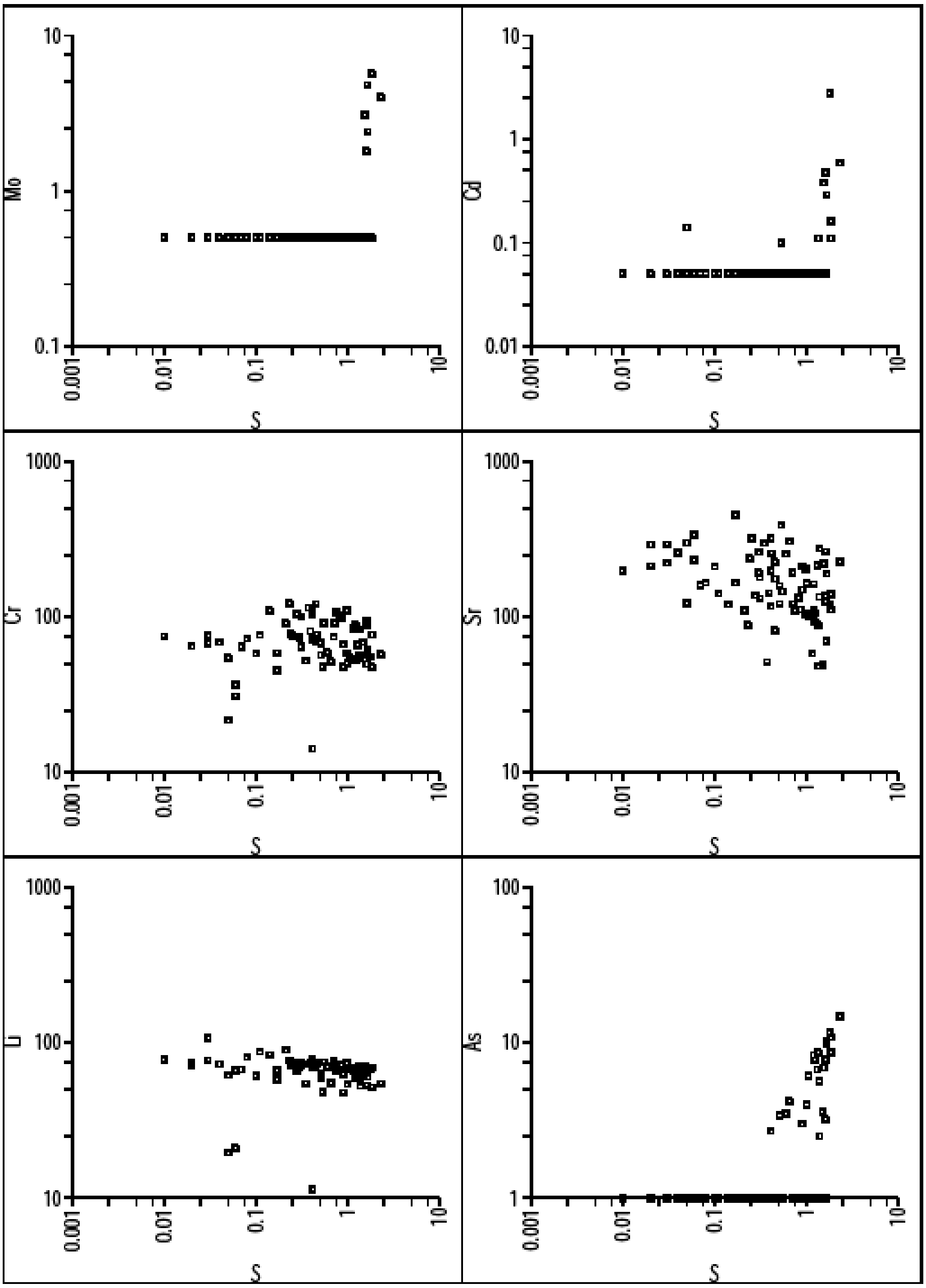

Figure 5g. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined using Leco stove in samples from Ankerskogen.

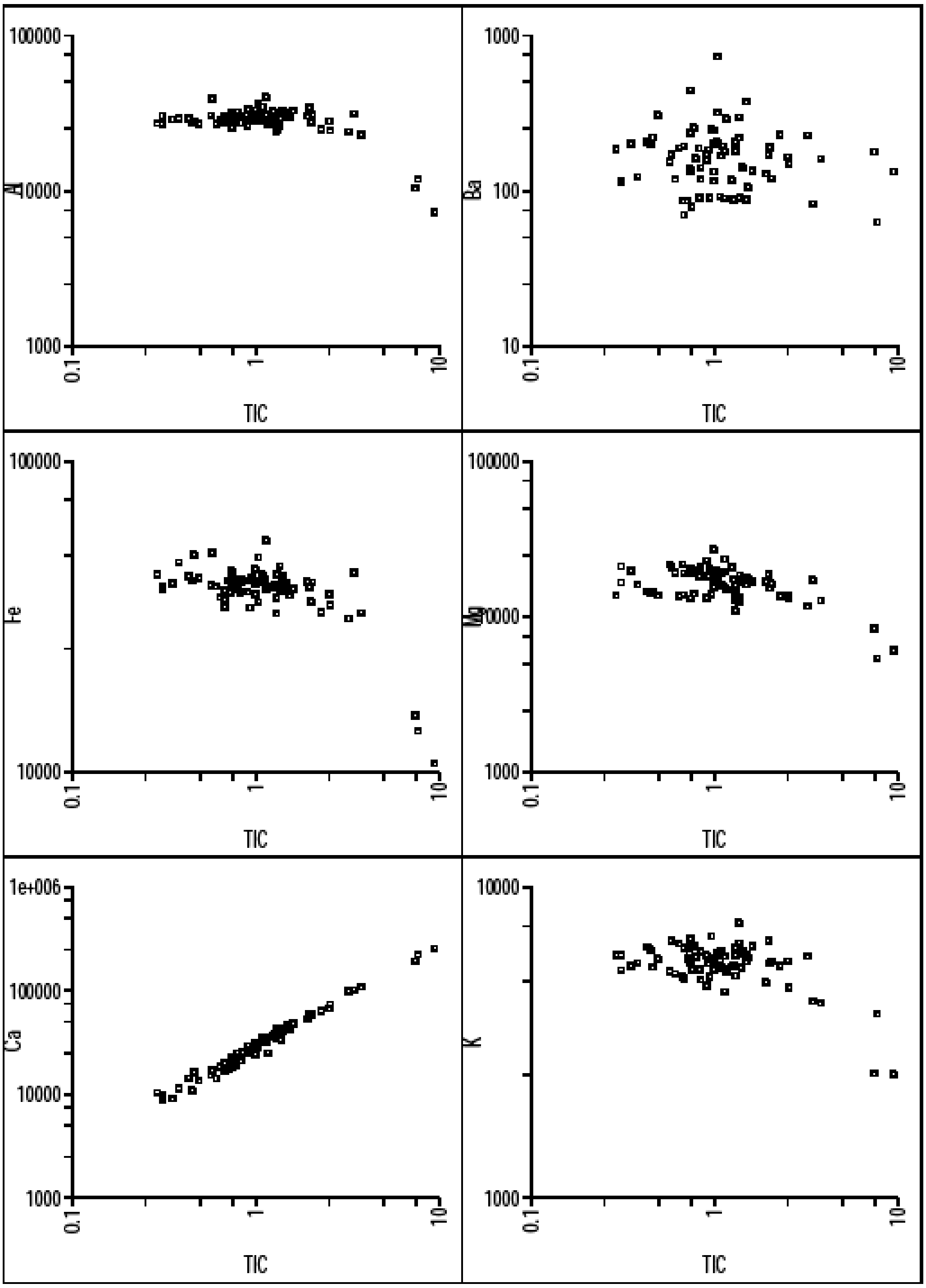

Figure 5h. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Ankerskogen.

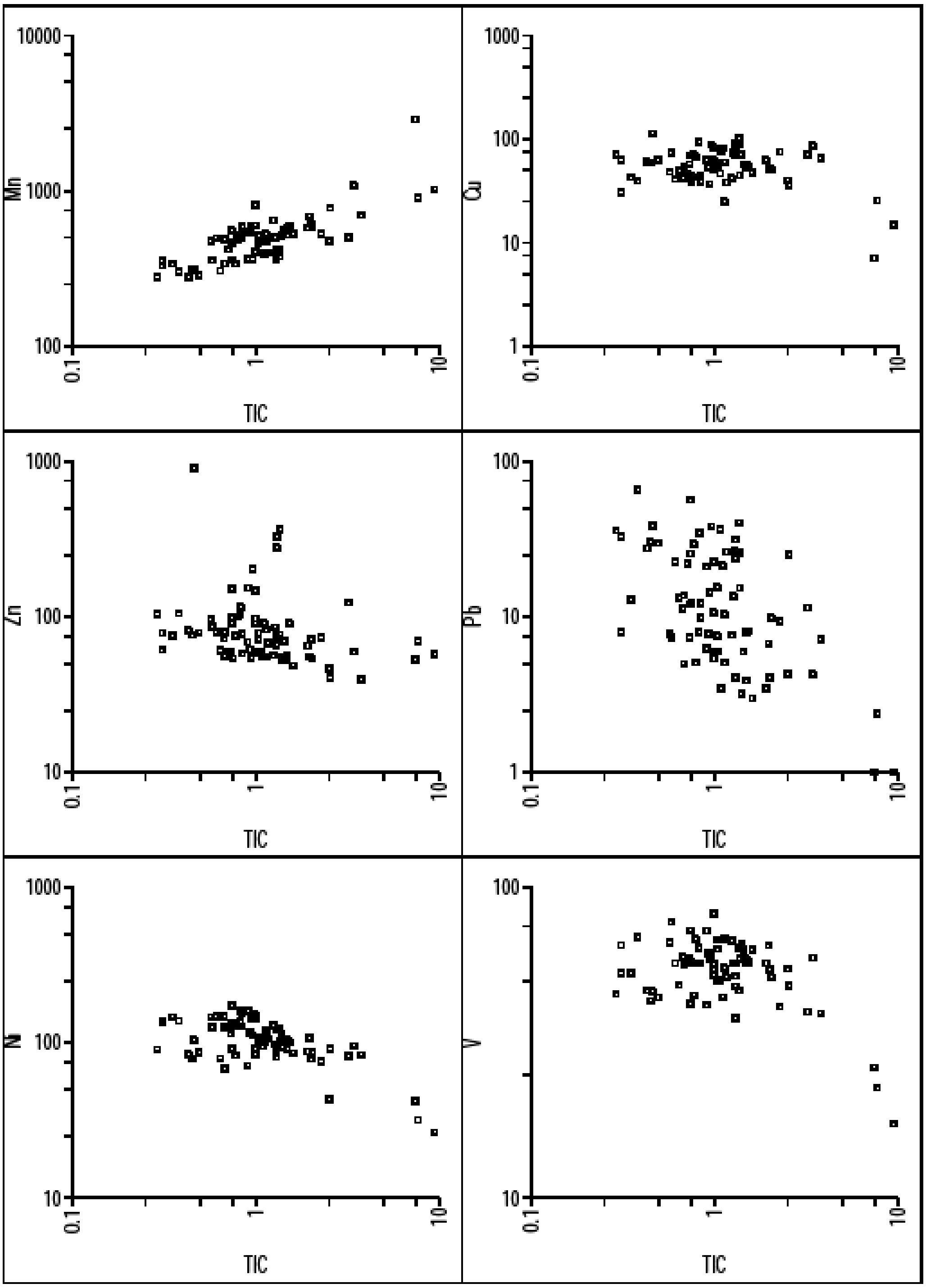

Figure 5i. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Ankerskogen.

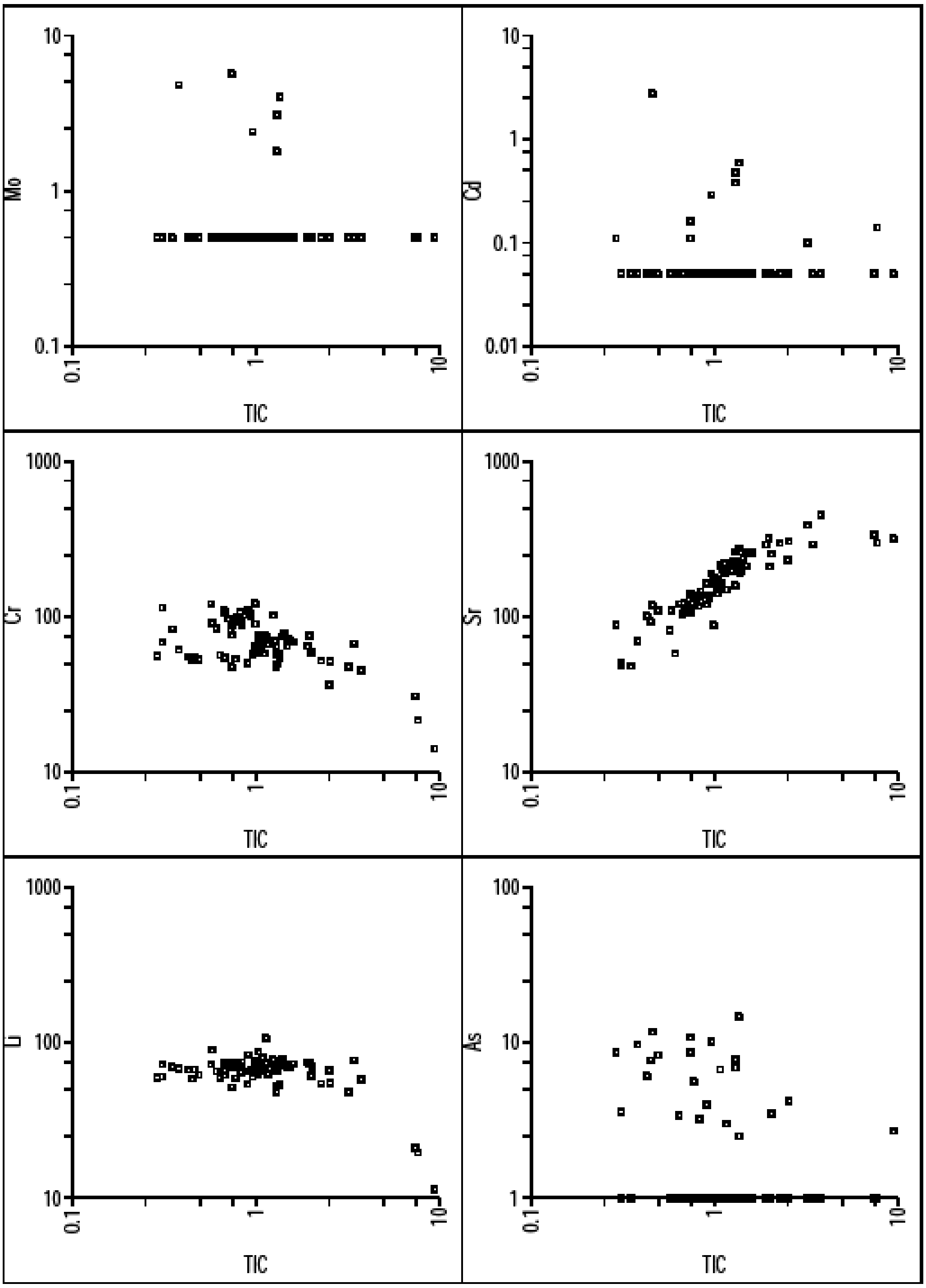

Figure 5j. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Ankerskogen.

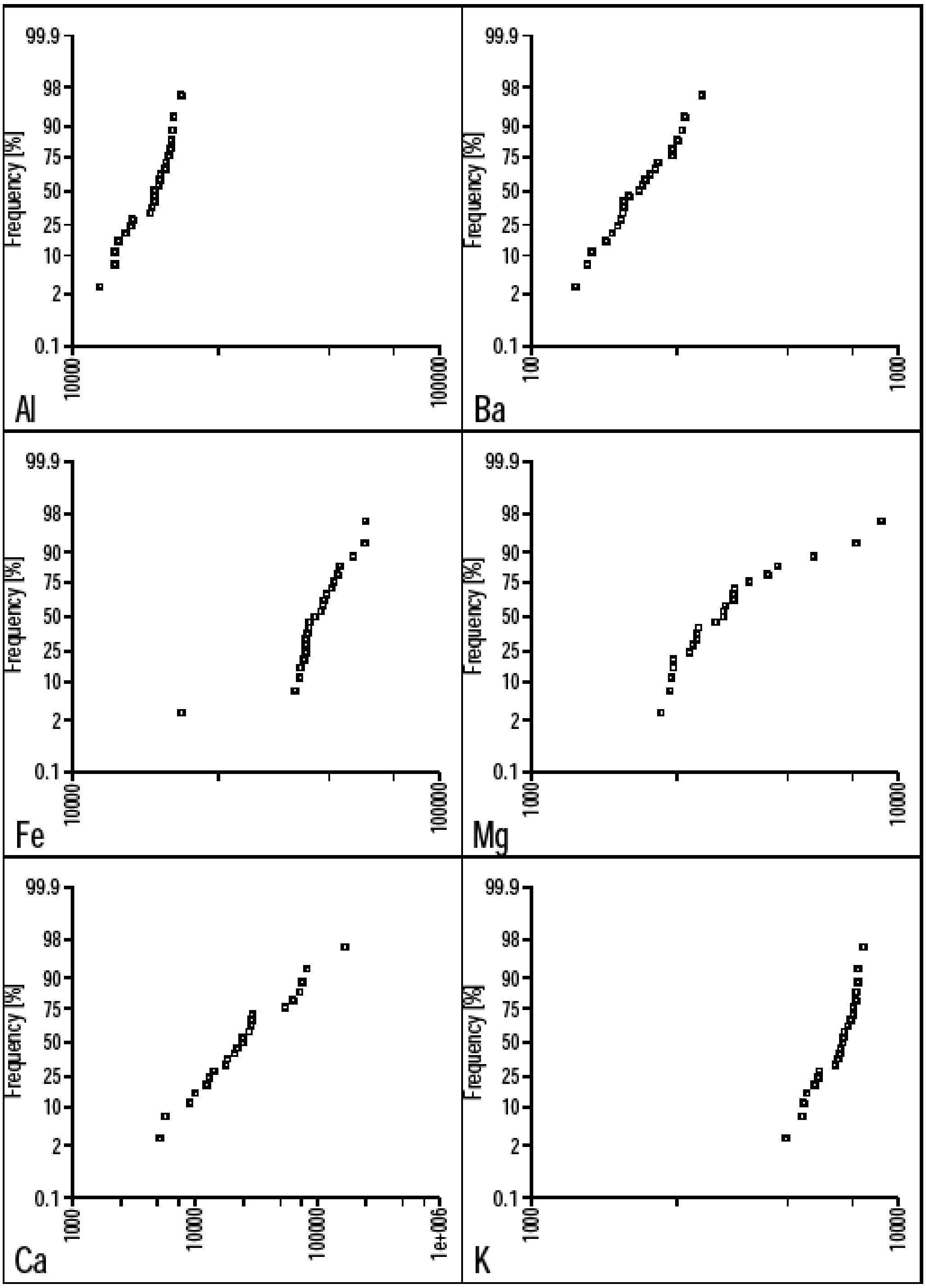

Figure 6a. Cumulative frequency distribution curves Øvre Slottsgt. of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES.

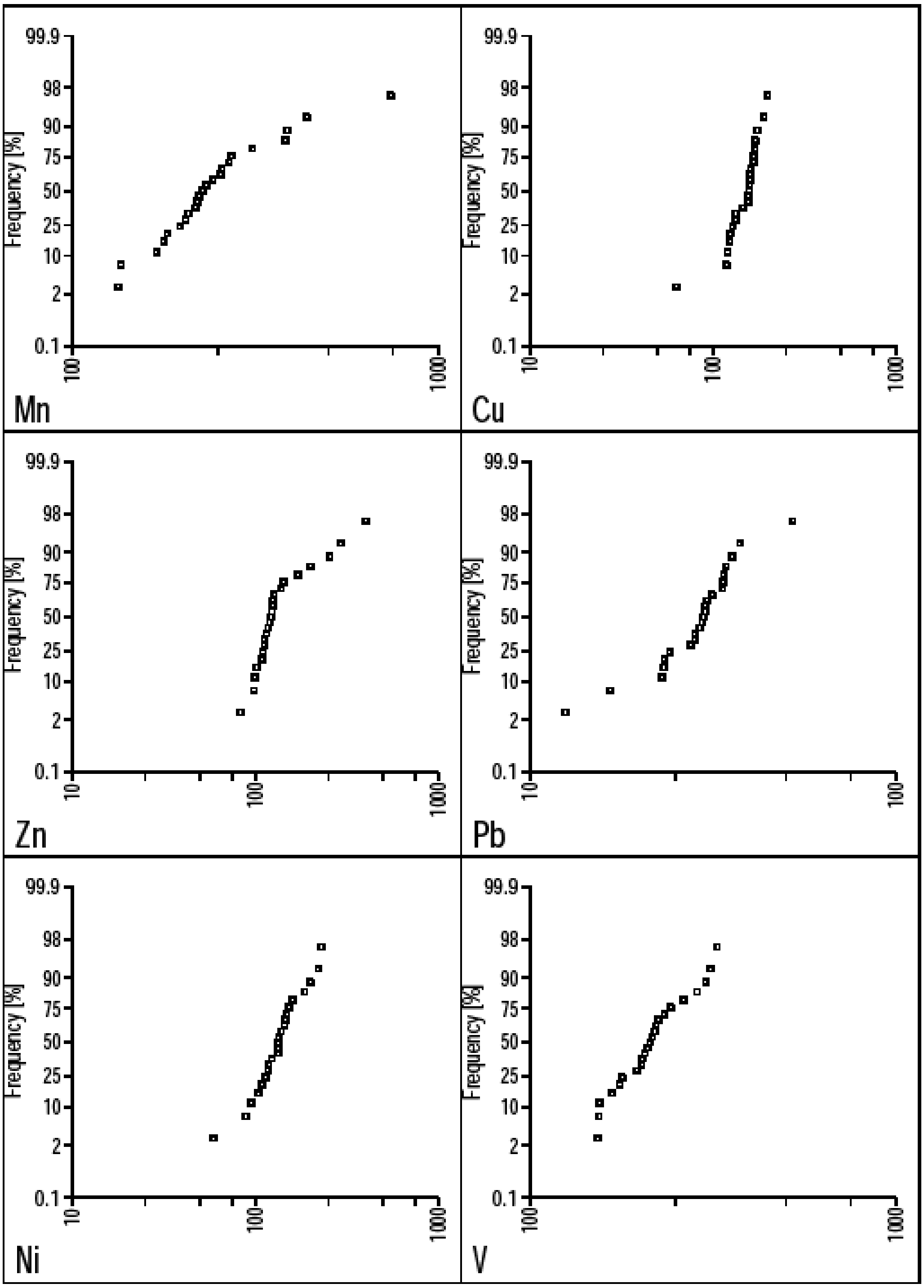

Figure 6b. Cumulative frequency distribution curves Øvre Slottsgt. of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES.

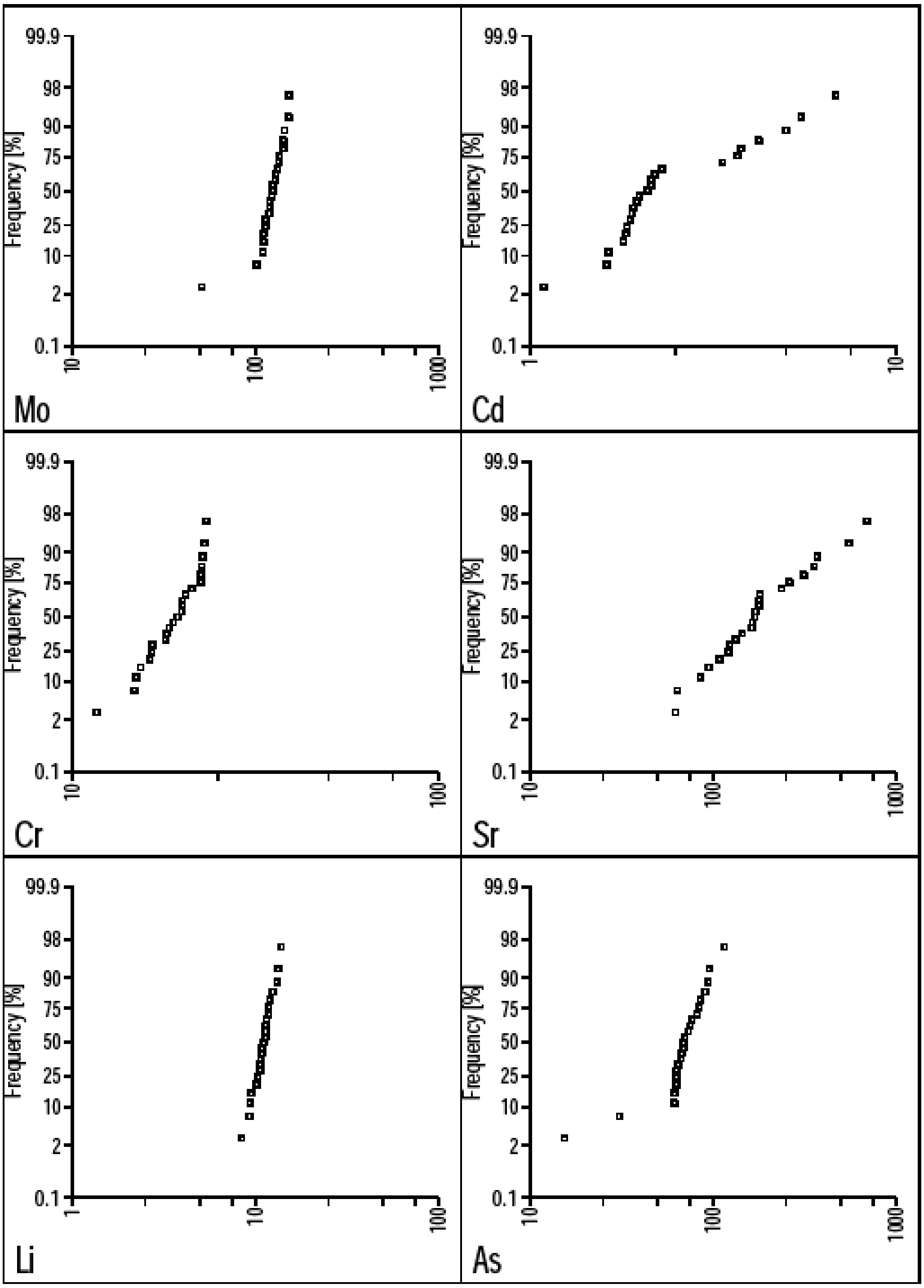

Figure 6c. Cumulative frequency distribution curves Øvre Slottsgt. of Mo, Cd, Cr, Sr, Li and As (mg/kg) determined by ICP-AES.

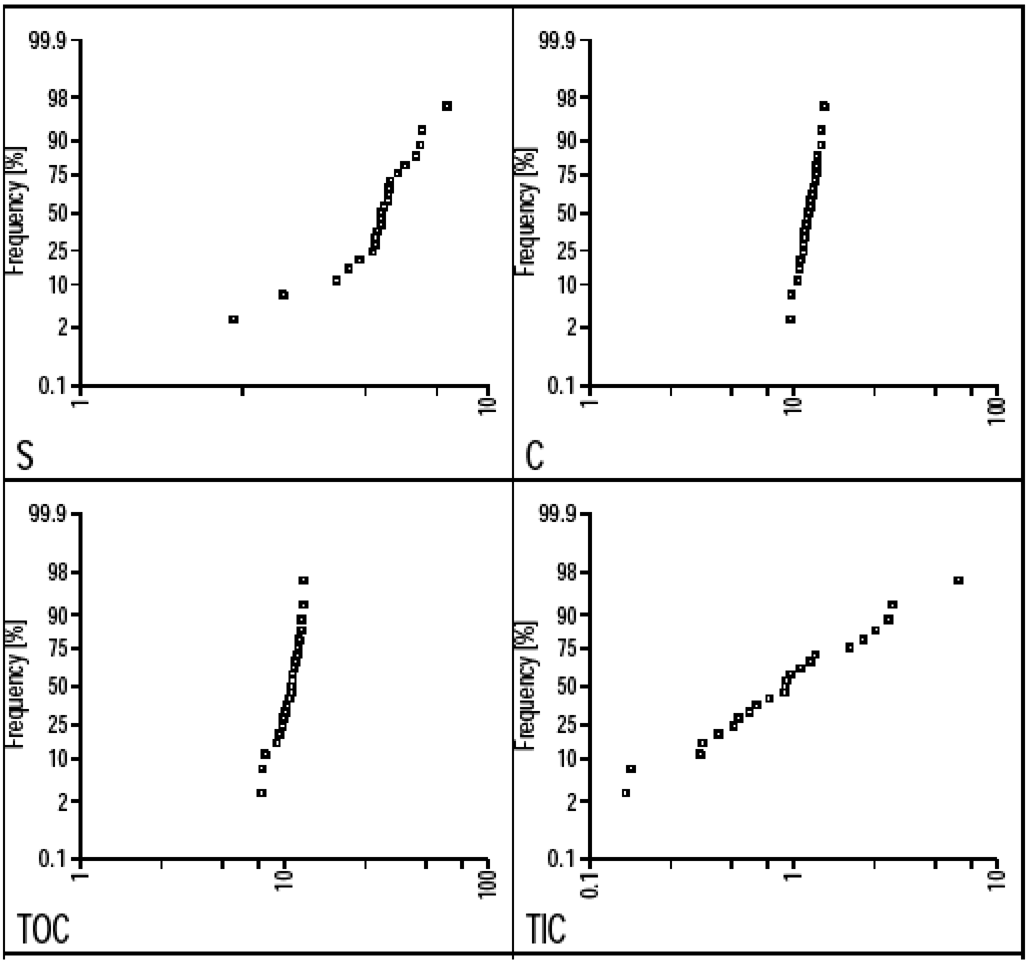

Figure 7: Cumulative frequency distribution curves for S, C, TOC, and TIC (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

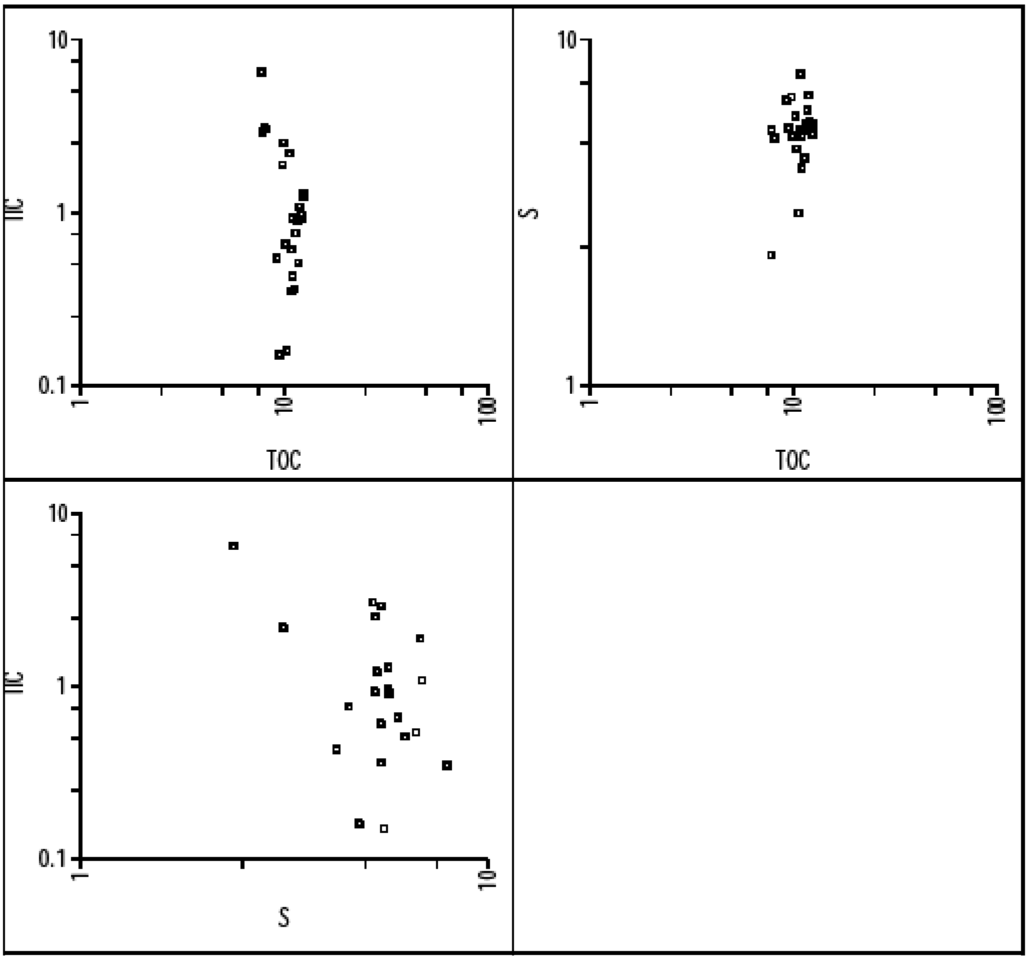

Figure 8a. XY-diagrams Øvre Slottsgt. of TOC, S, and TIC (wt. %) determined using Leco stove plotted against each other.

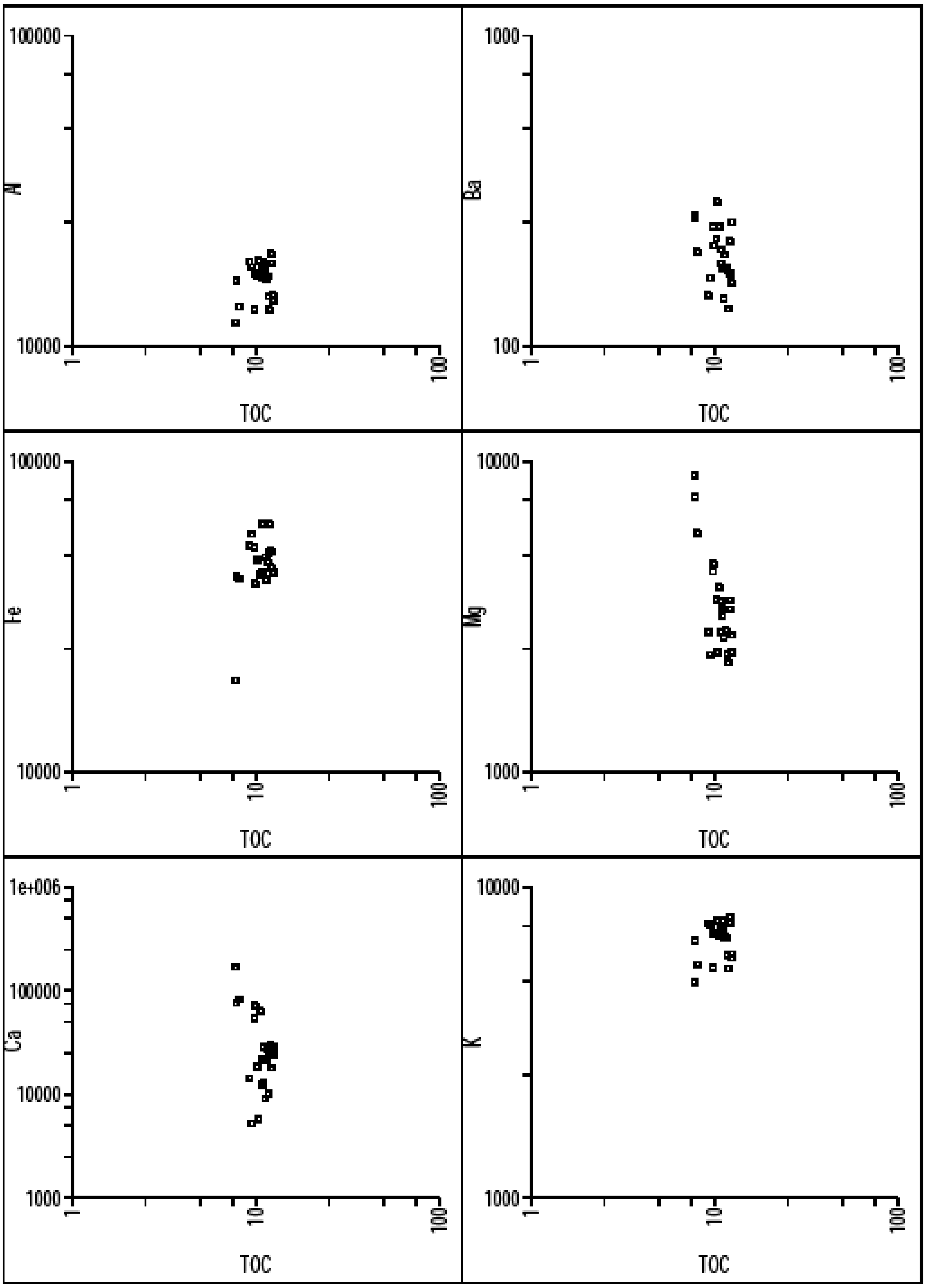

Figure 8b. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES plotted versus TOC (wt. %) in samples from Øvre Slottsgt.

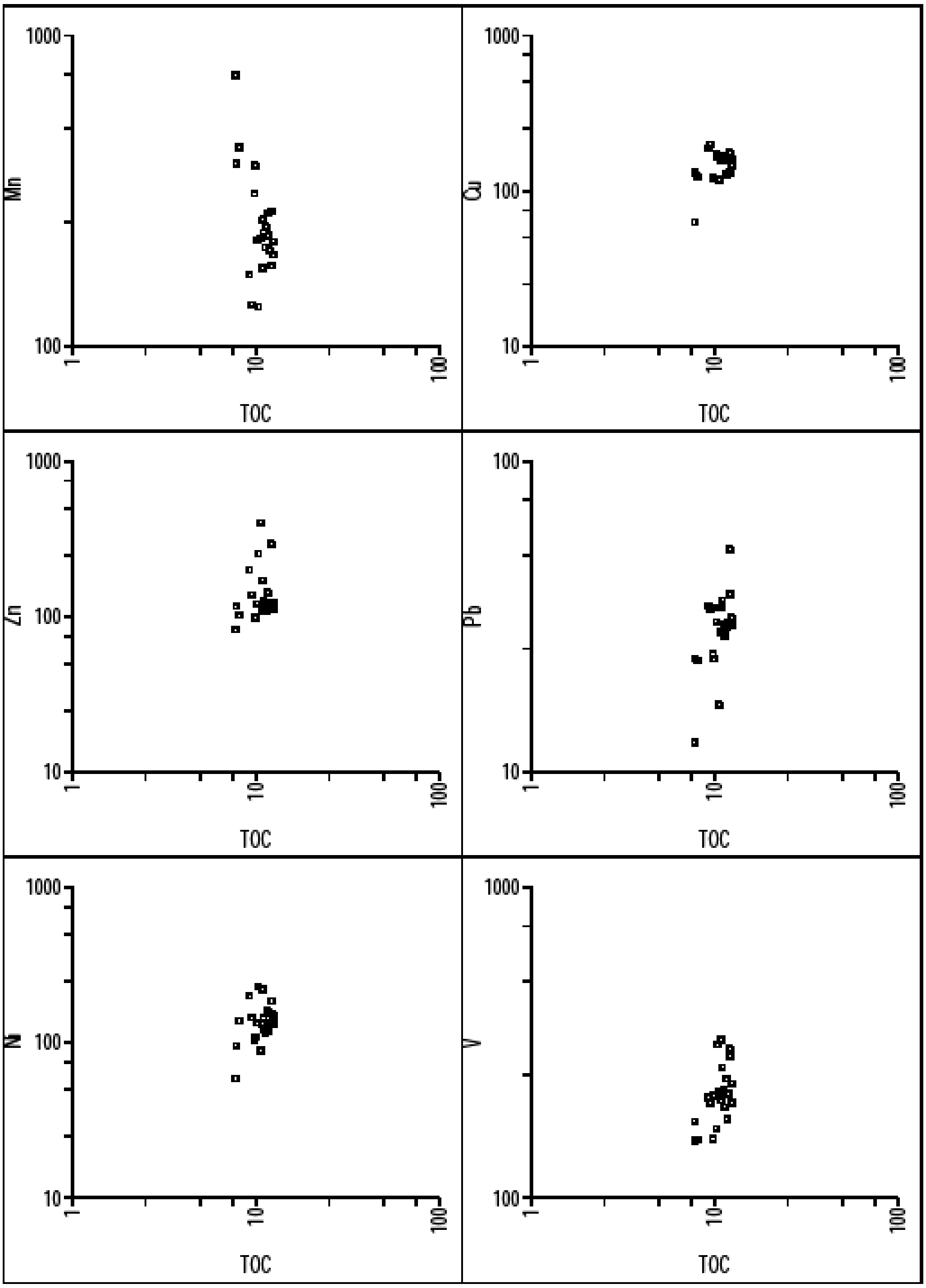

Figure 8c. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES plotted versus TOC (wt. %) in samples from Øvre Slottsgt.

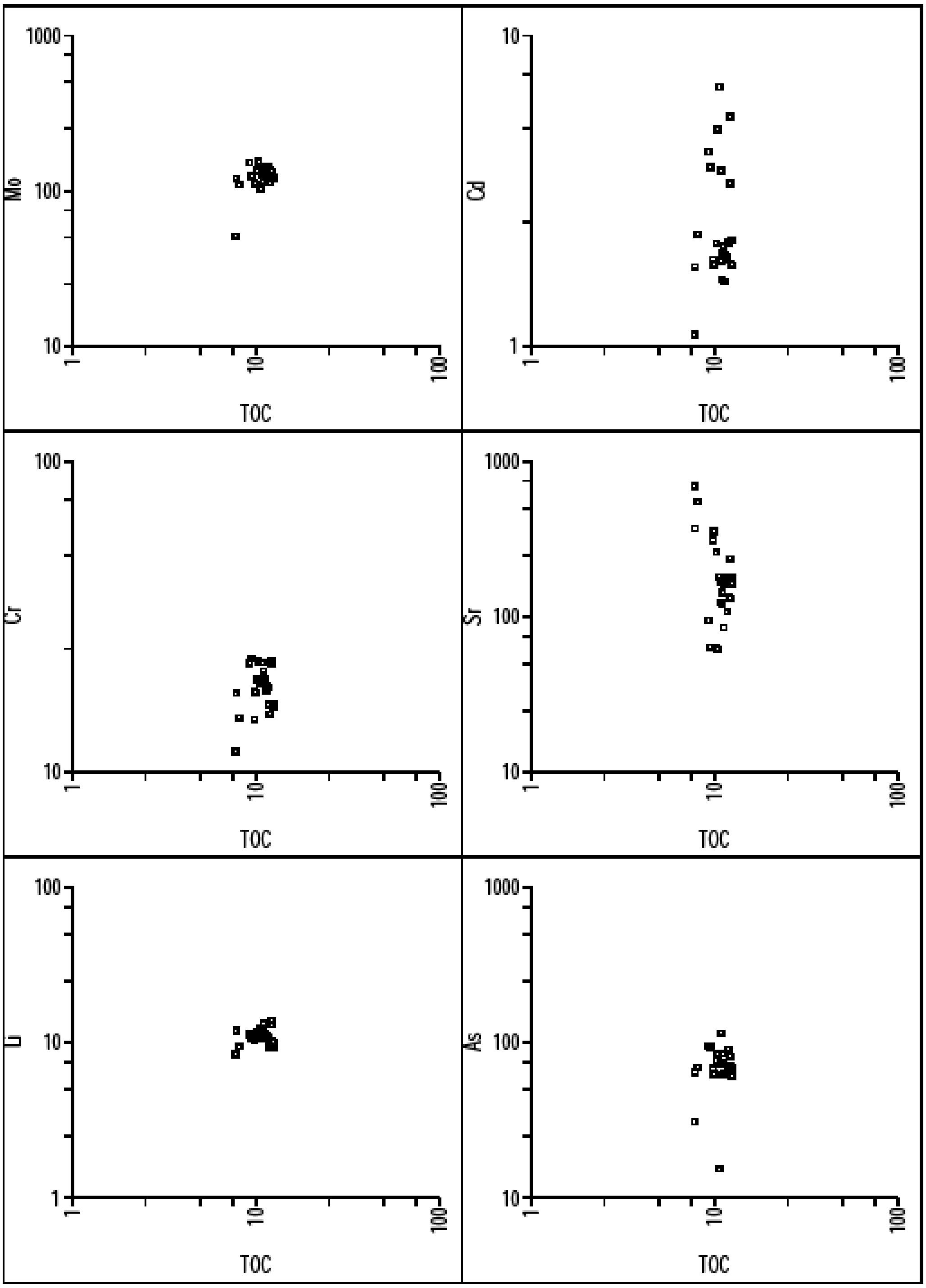

Figure 8d. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus TOC (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

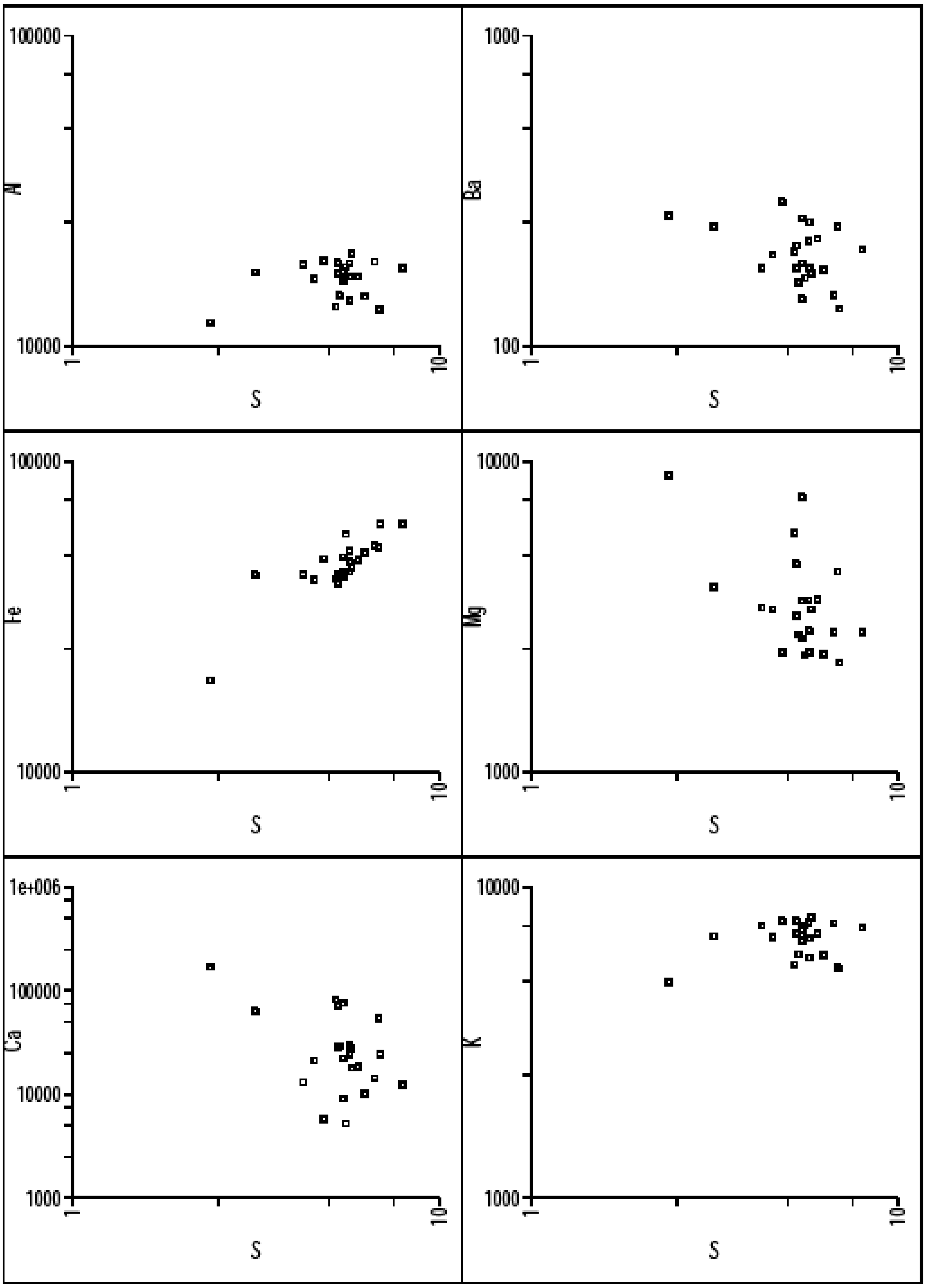

Figure 8e. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined by using Leco stove in samples from Øvre Slottsgt.

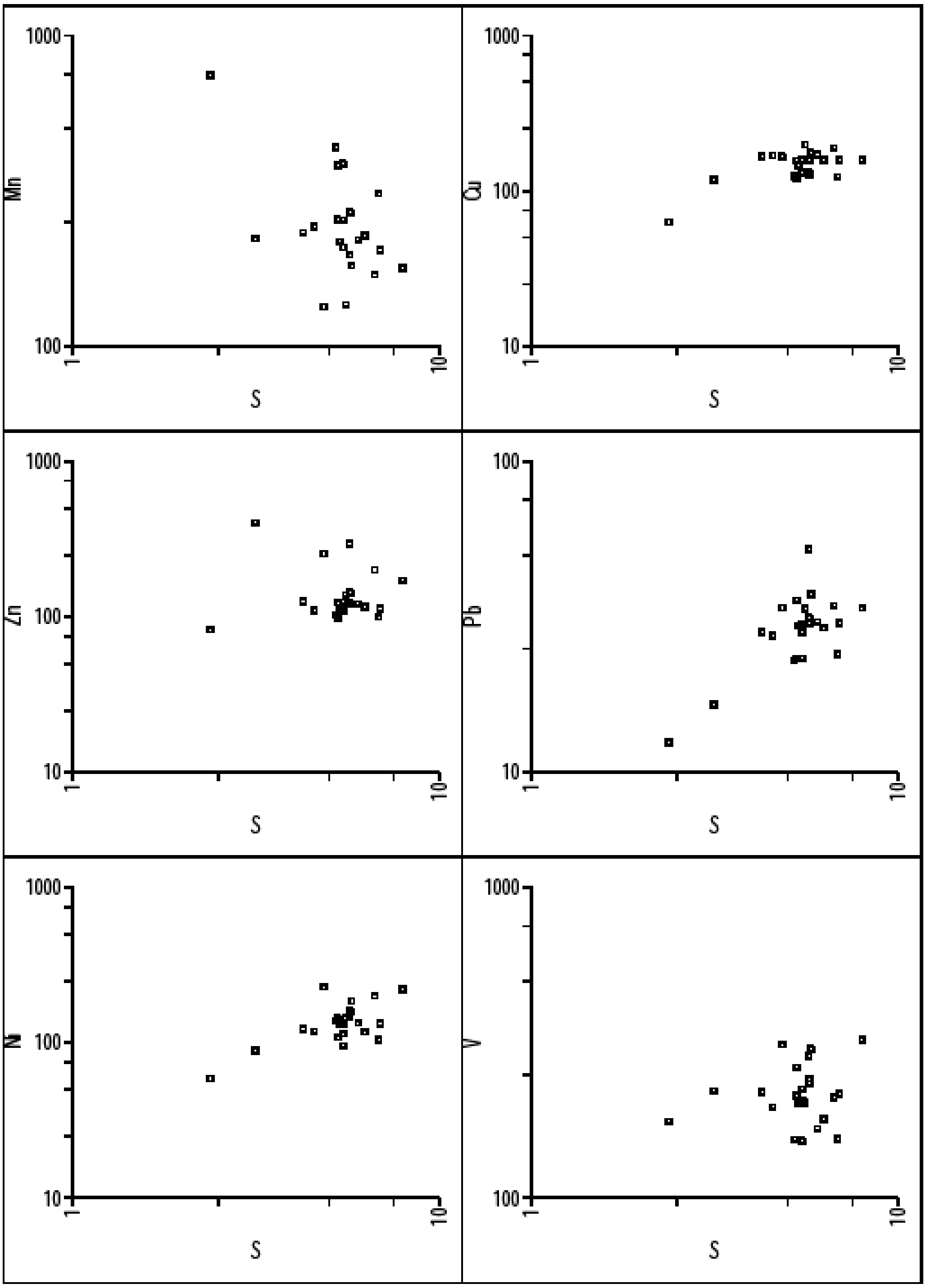

Figure 8f. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

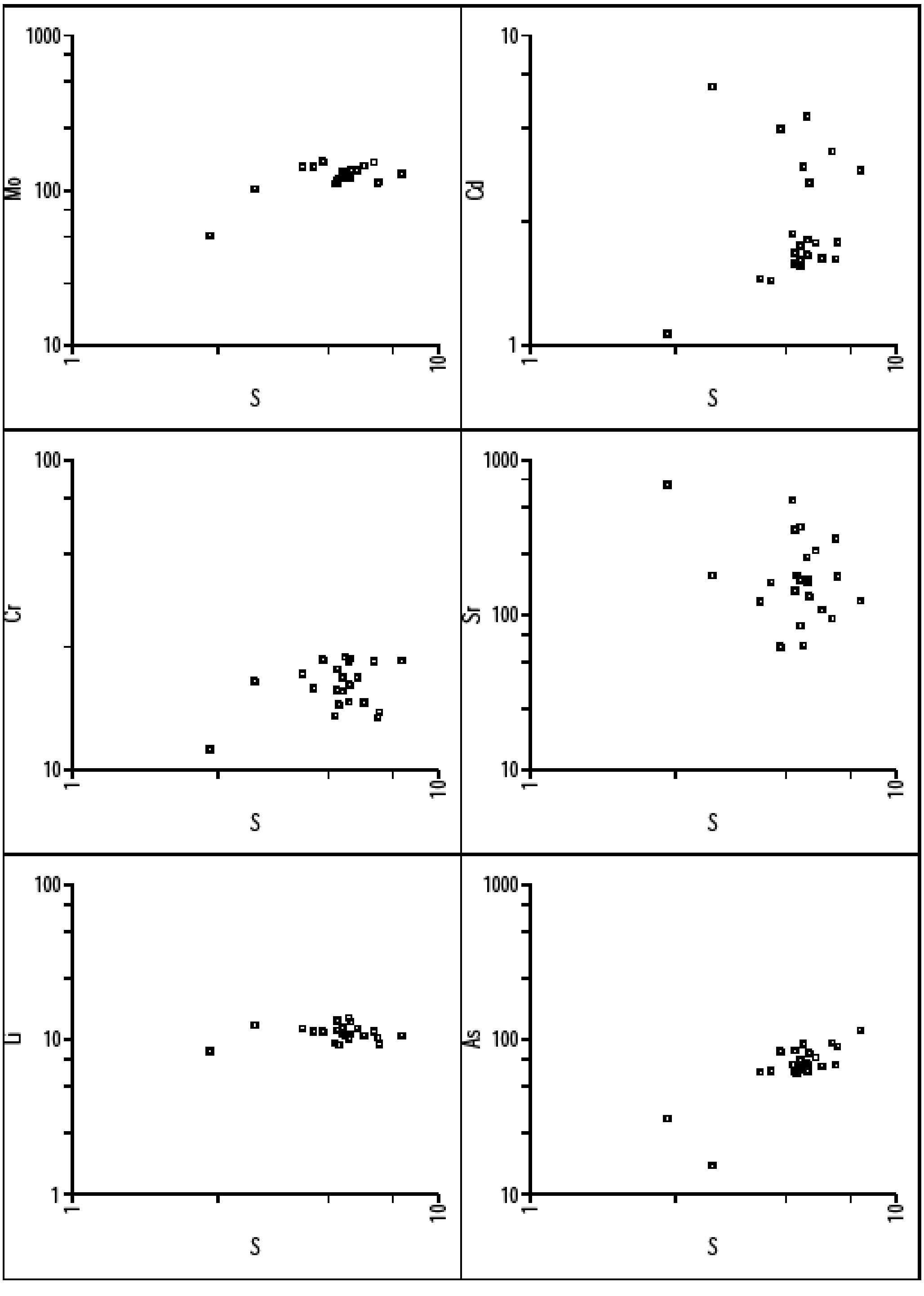

Figure 8g. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus S (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

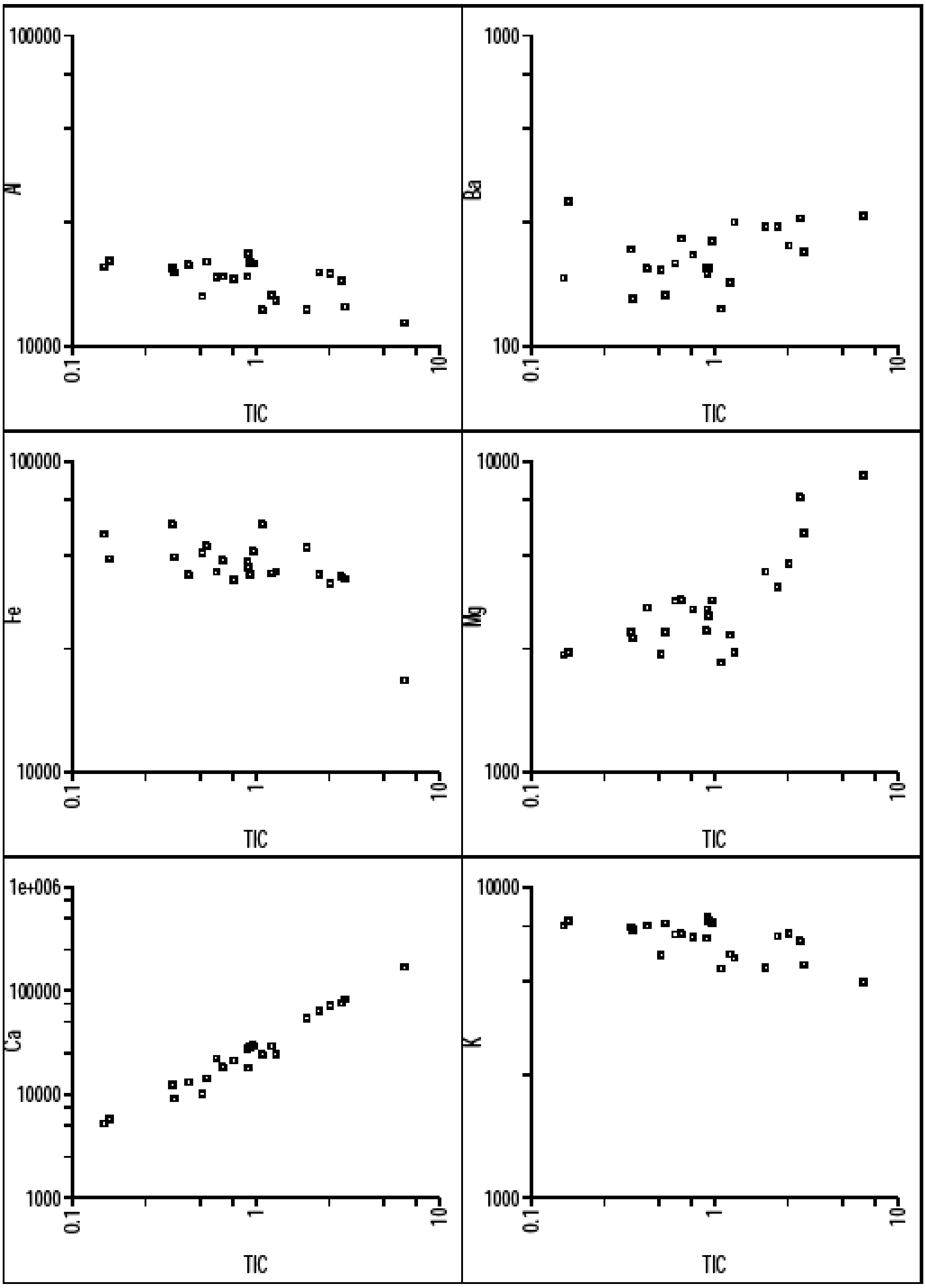

Figure 8h. XY-diagrams of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

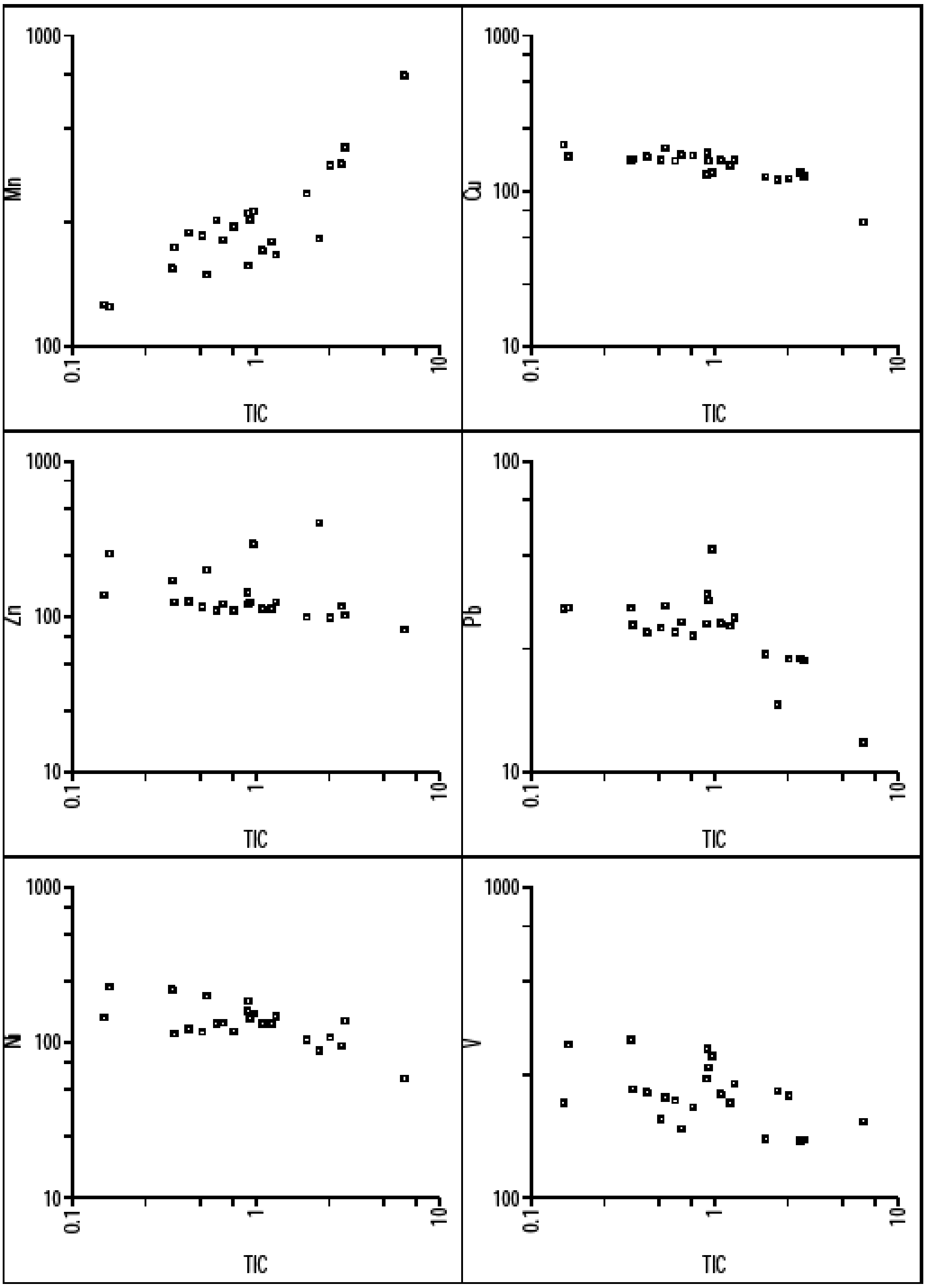

Figure 8i. XY-diagrams of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

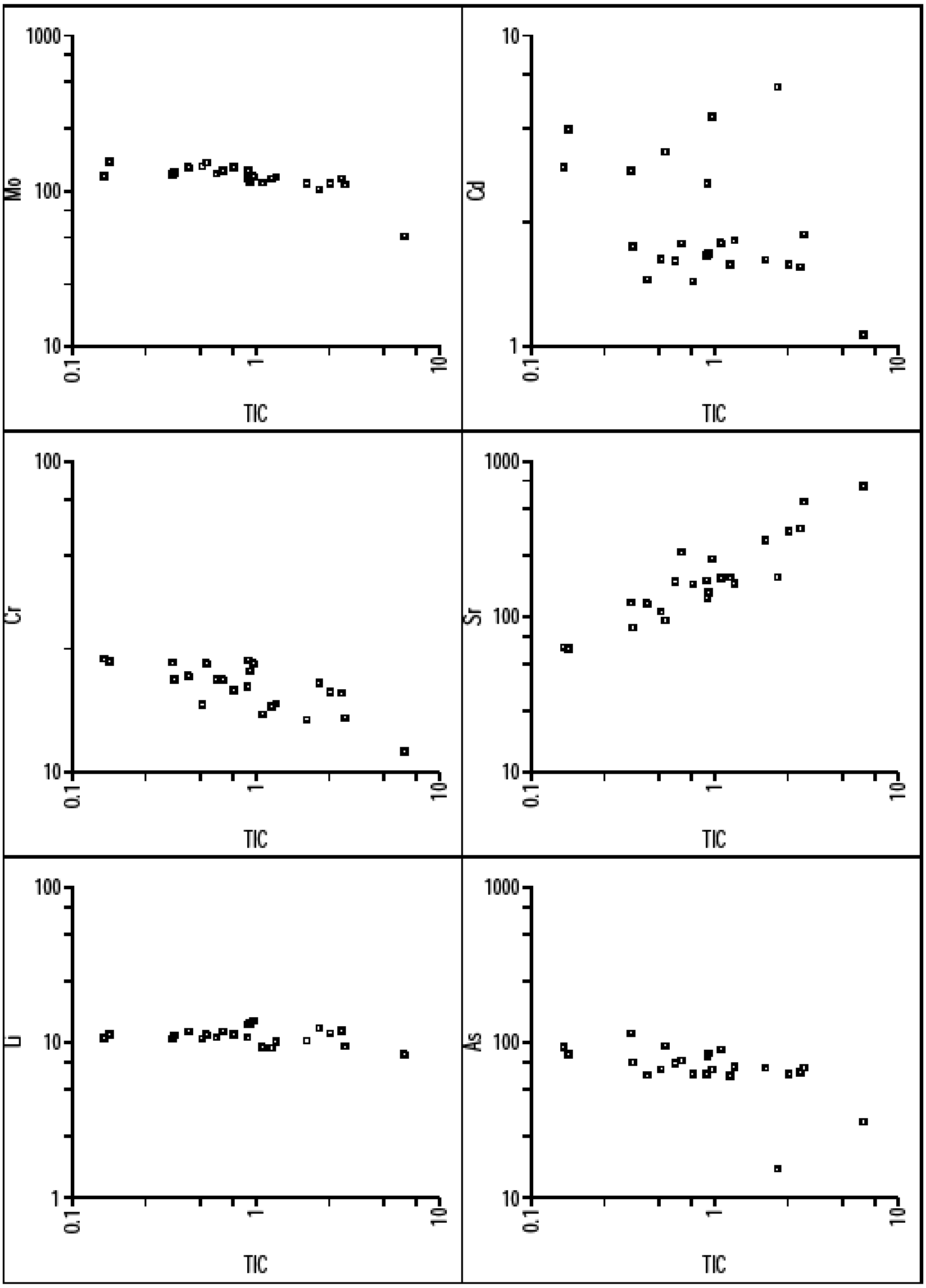

Figure 8j. XY-diagrams of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES plotted versus TIC (wt. %) determined using Leco stove in samples from Øvre Slottsgt.

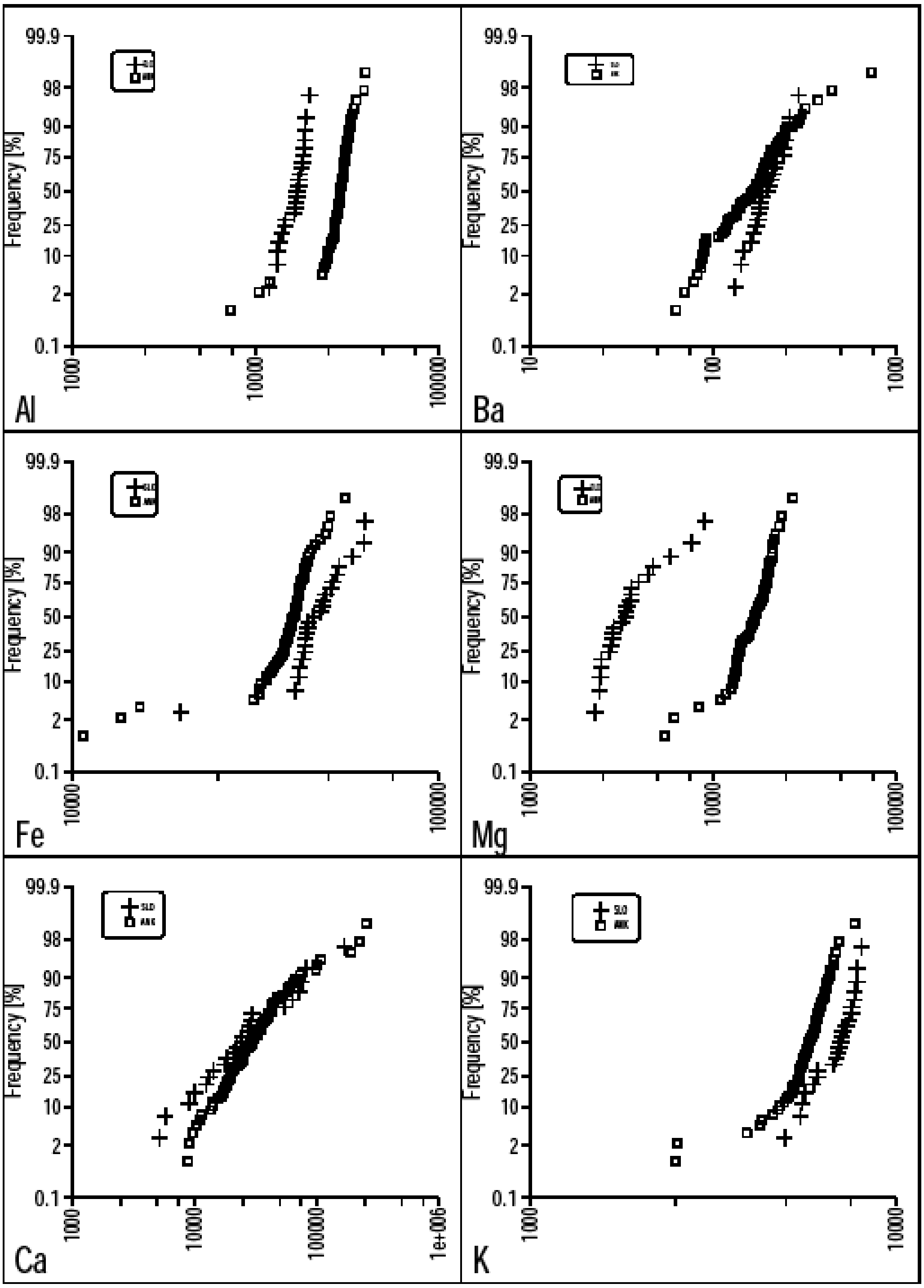

Figure 9a. Cumulative frequency distribution curves of Al, Ba, Fe, Mg, Ca, and K (mg/kg) determined by ICP-AES in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

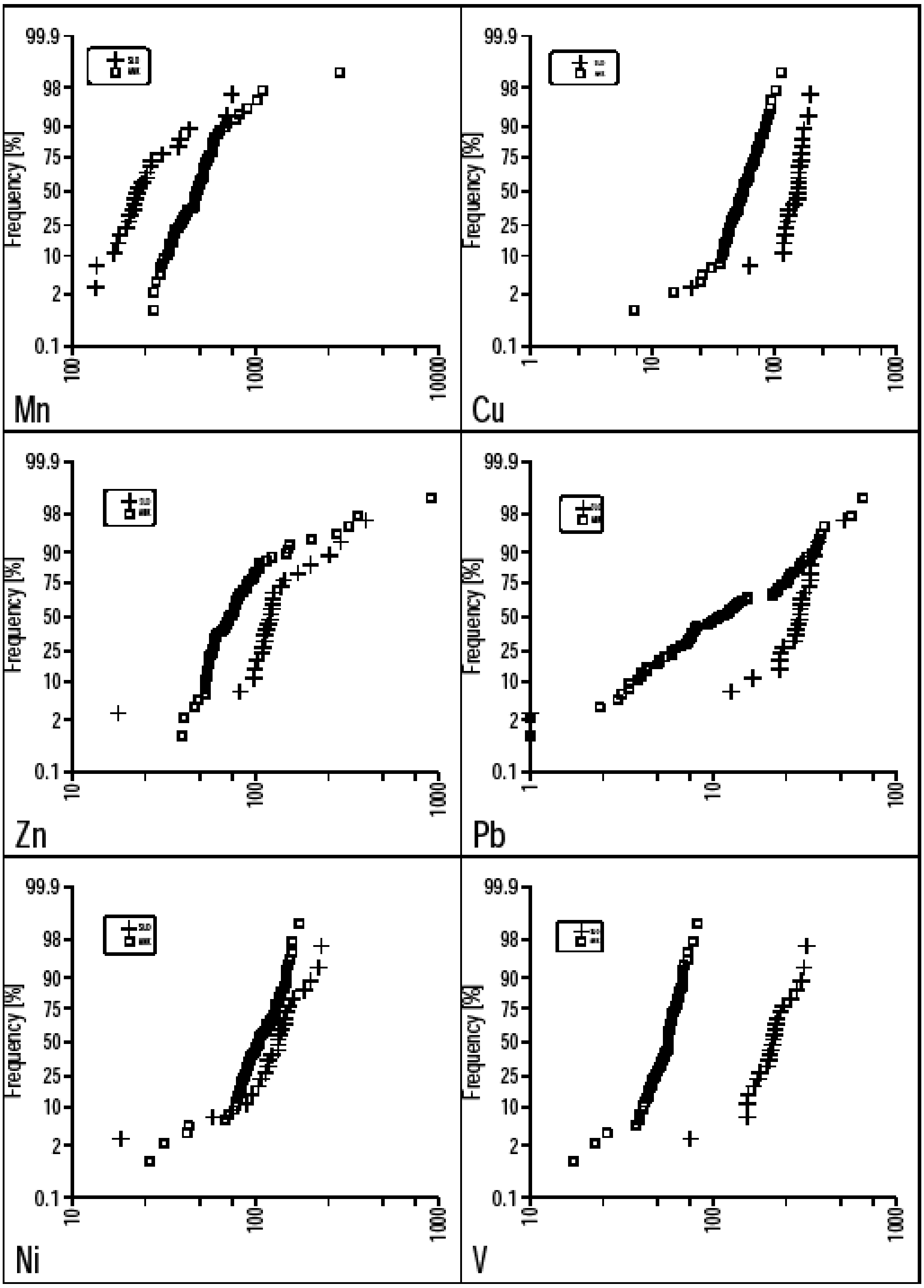

Figure 9b. Cumulative frequency distribution curves of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) determined by ICP-AES in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

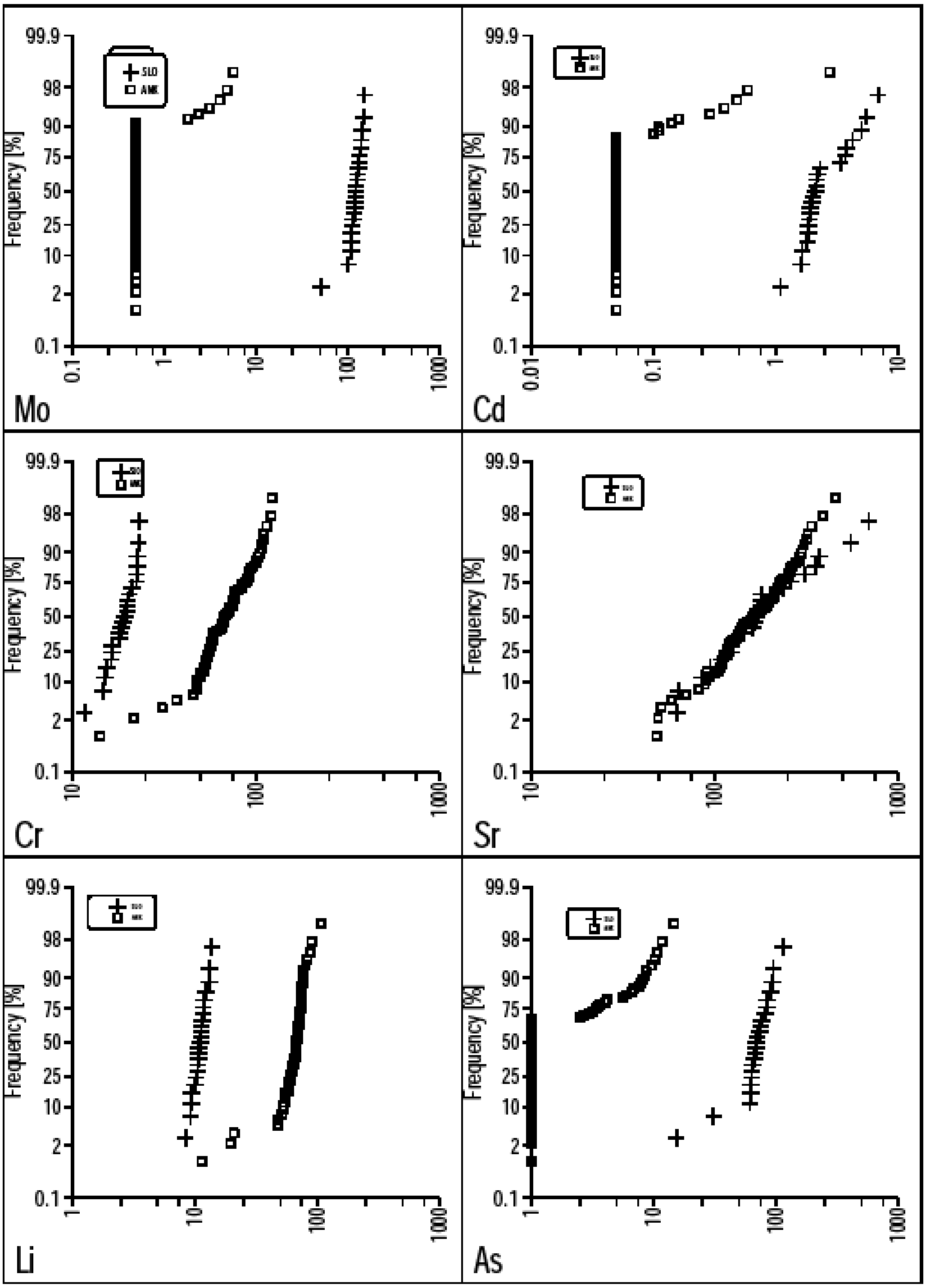

Figure 9c. Cumulative frequency distribution curves of Mo, Cd, Cr, Sr, Li, and As (mg/kg) determined by ICP-AES in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

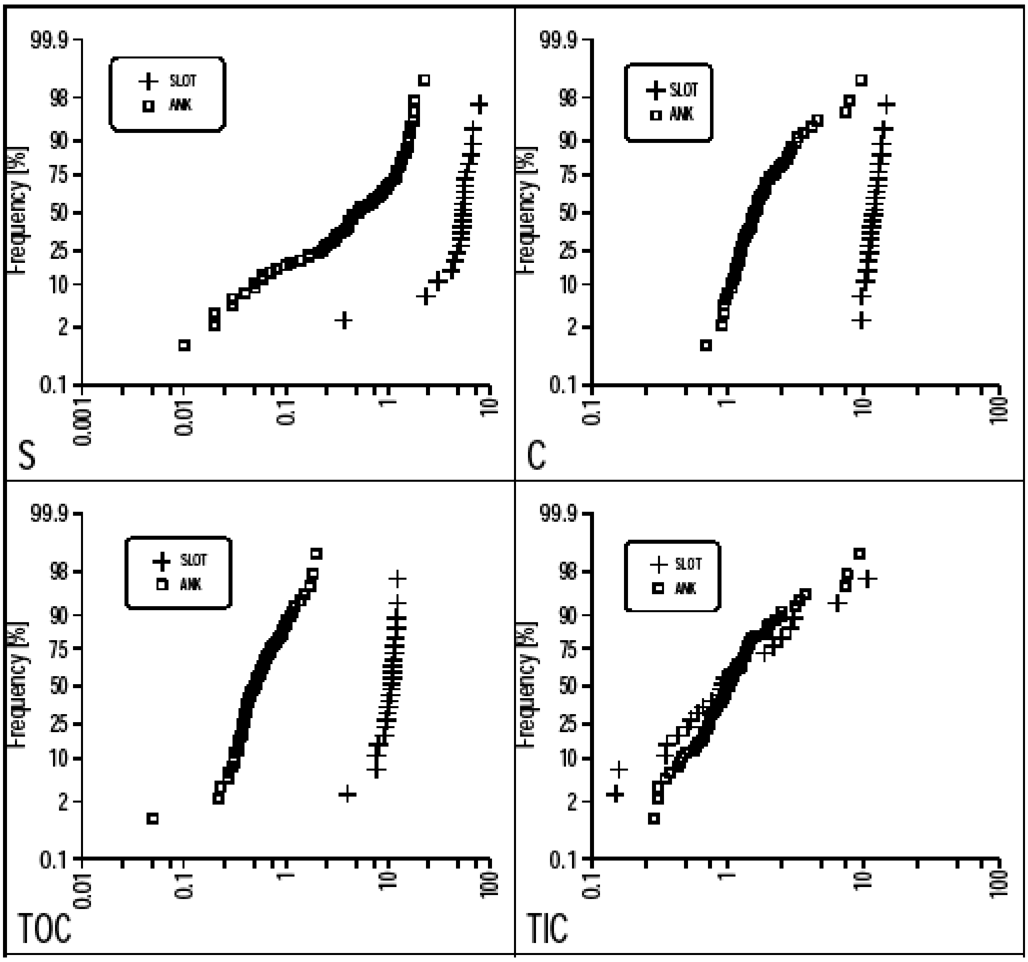

Figure 10. Cumulative frequency distribution curves for S, C, TOC, and TIC (wt. %) determined using Leco stove in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

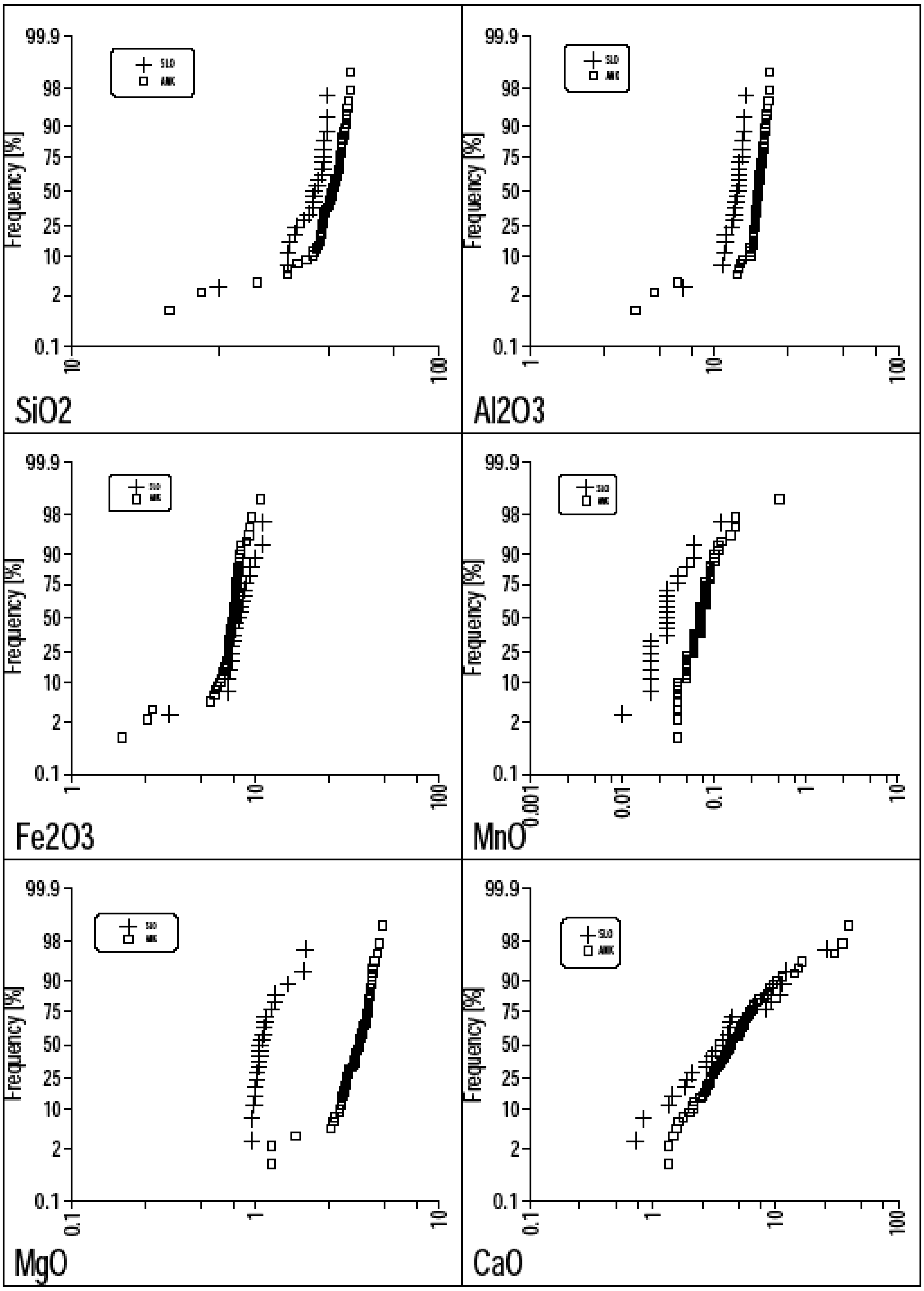

Figure 11a. Cumulative frequency distribution curves for SiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, and CaO (wt. %) in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

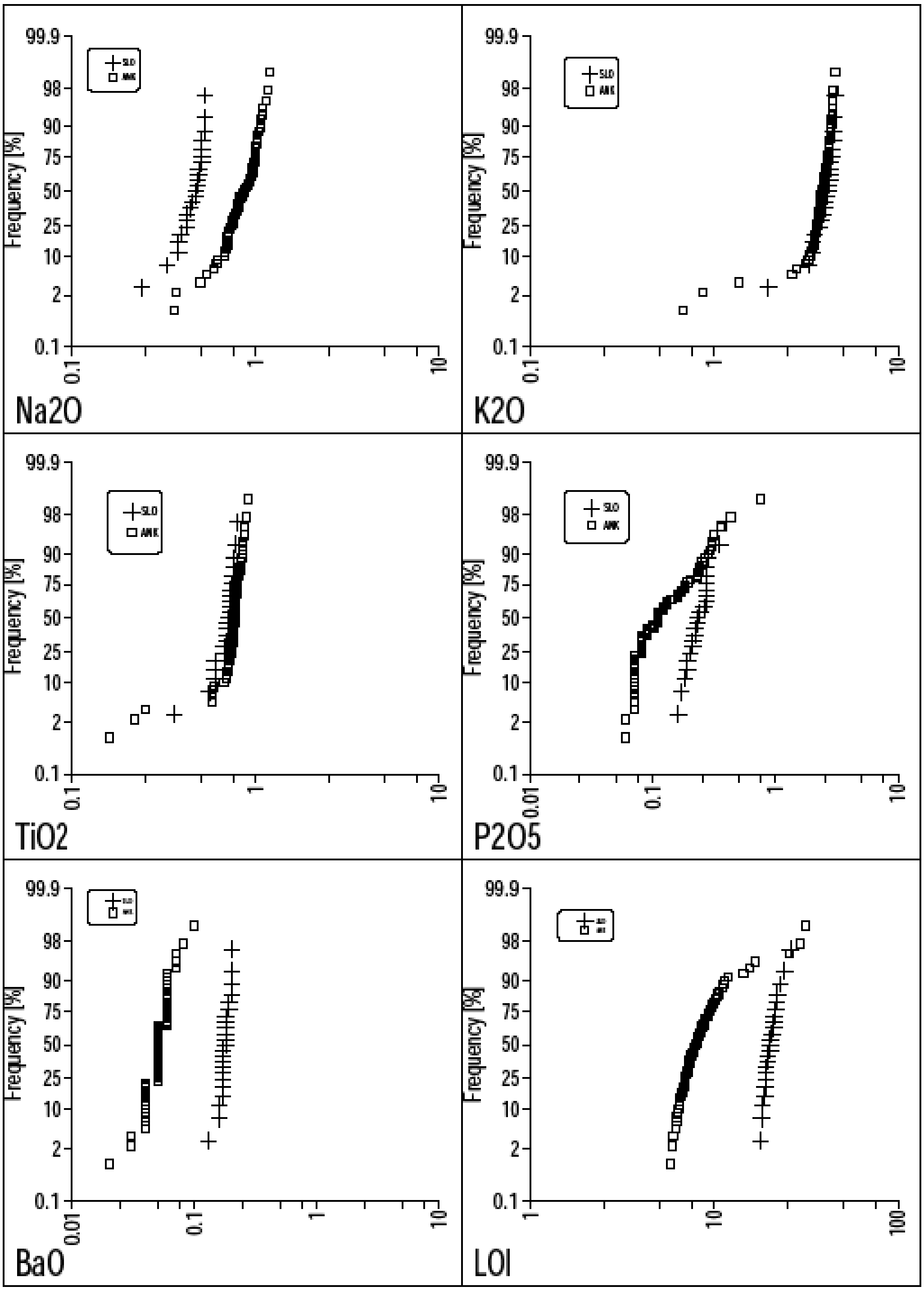

Figure 11b. Cumulative frequency distribution curves for Na_2O, K_2O, TiO_2, P_2O_5, BaO, and LOI (wt. %) determined by XRF in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

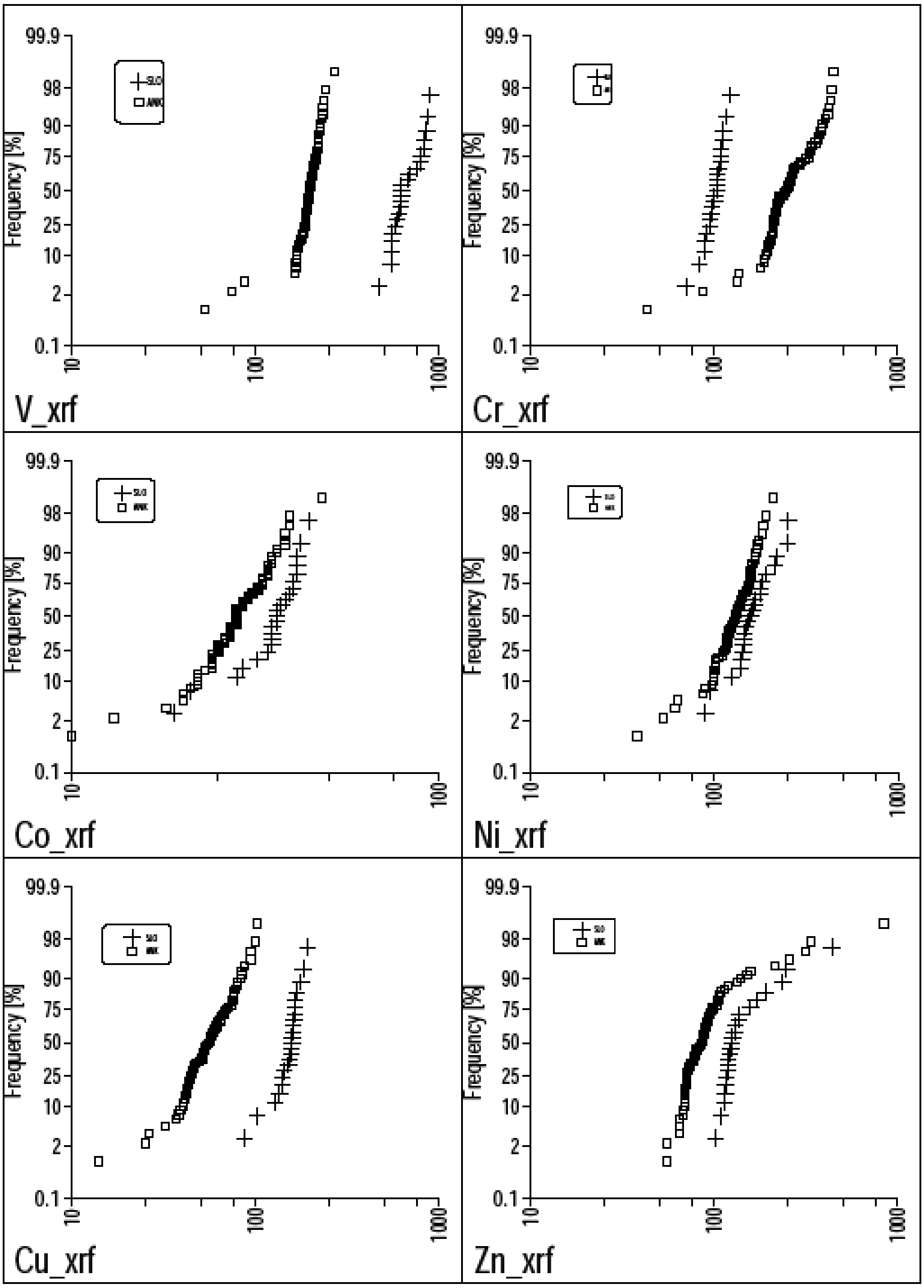

Figure 12a. Cumulative frequency distribution curves of V, Cr, Co, Ni, Cu, and Zn (mg/kg) determined by XRF in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

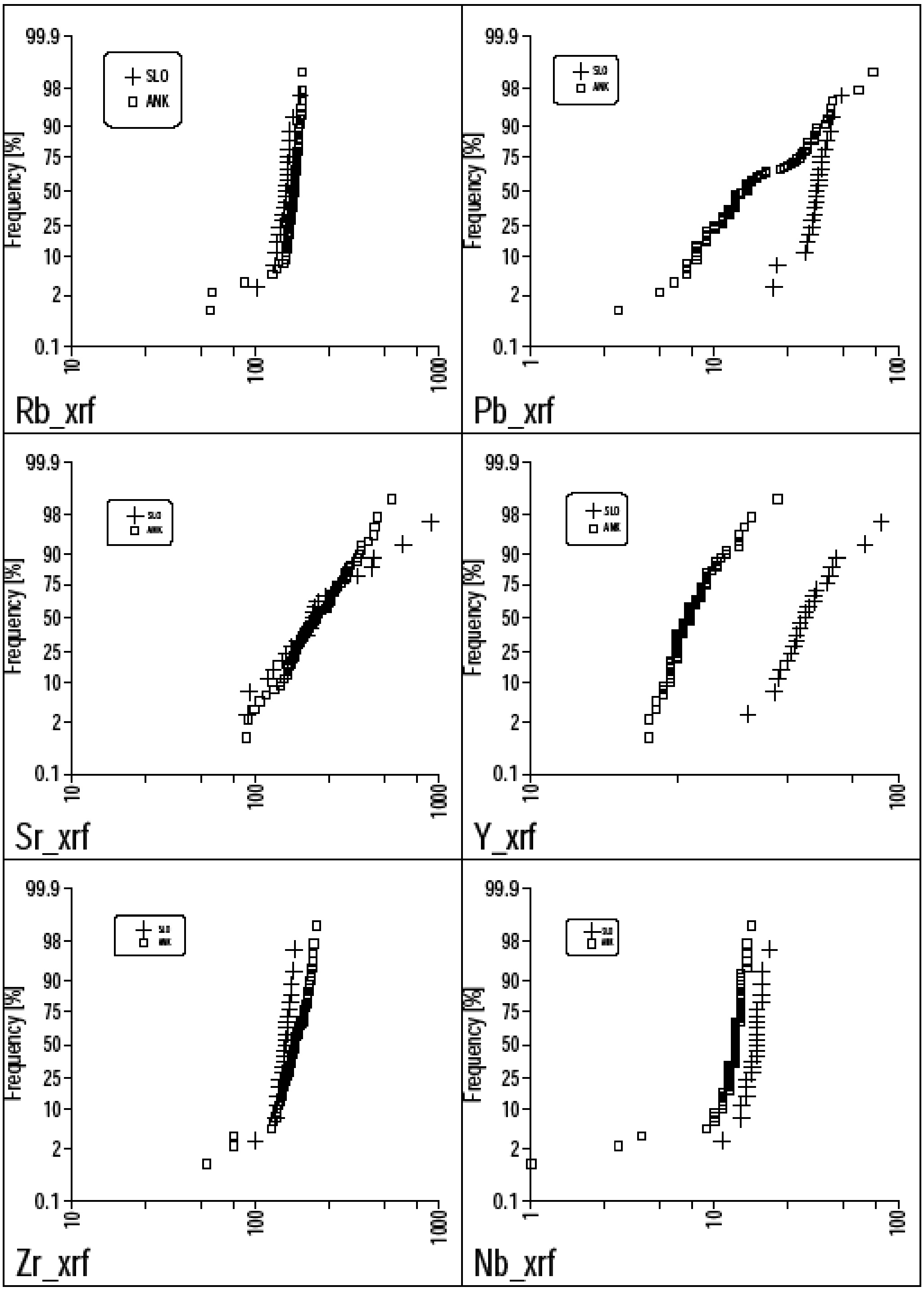

Figure 12b. Cumulative frequency distribution curves of Rb, Pb, Sr, Y, Zr, and Nb (mg/kg) determined by XRF in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

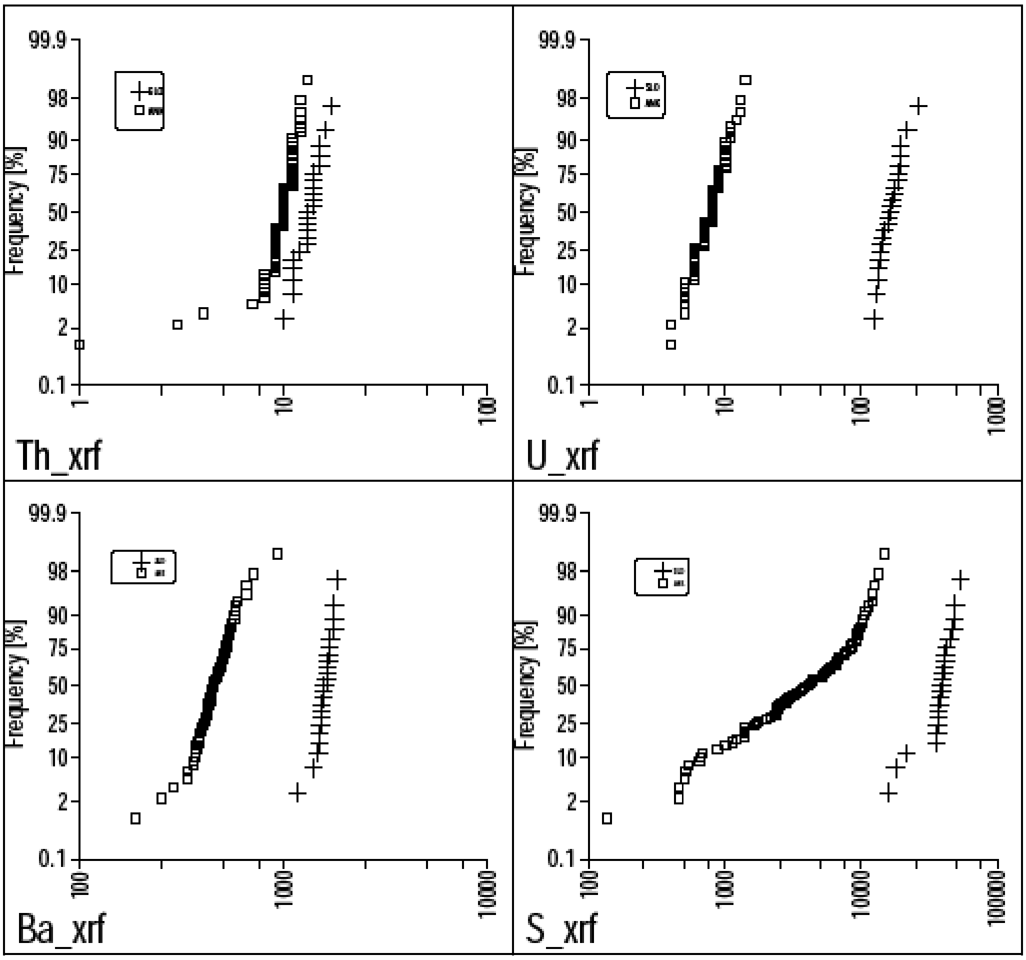

Figure 12c. Cumulative frequency distribution curves of Th, U, Ba, and S (mg/kg) determined by XRF in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

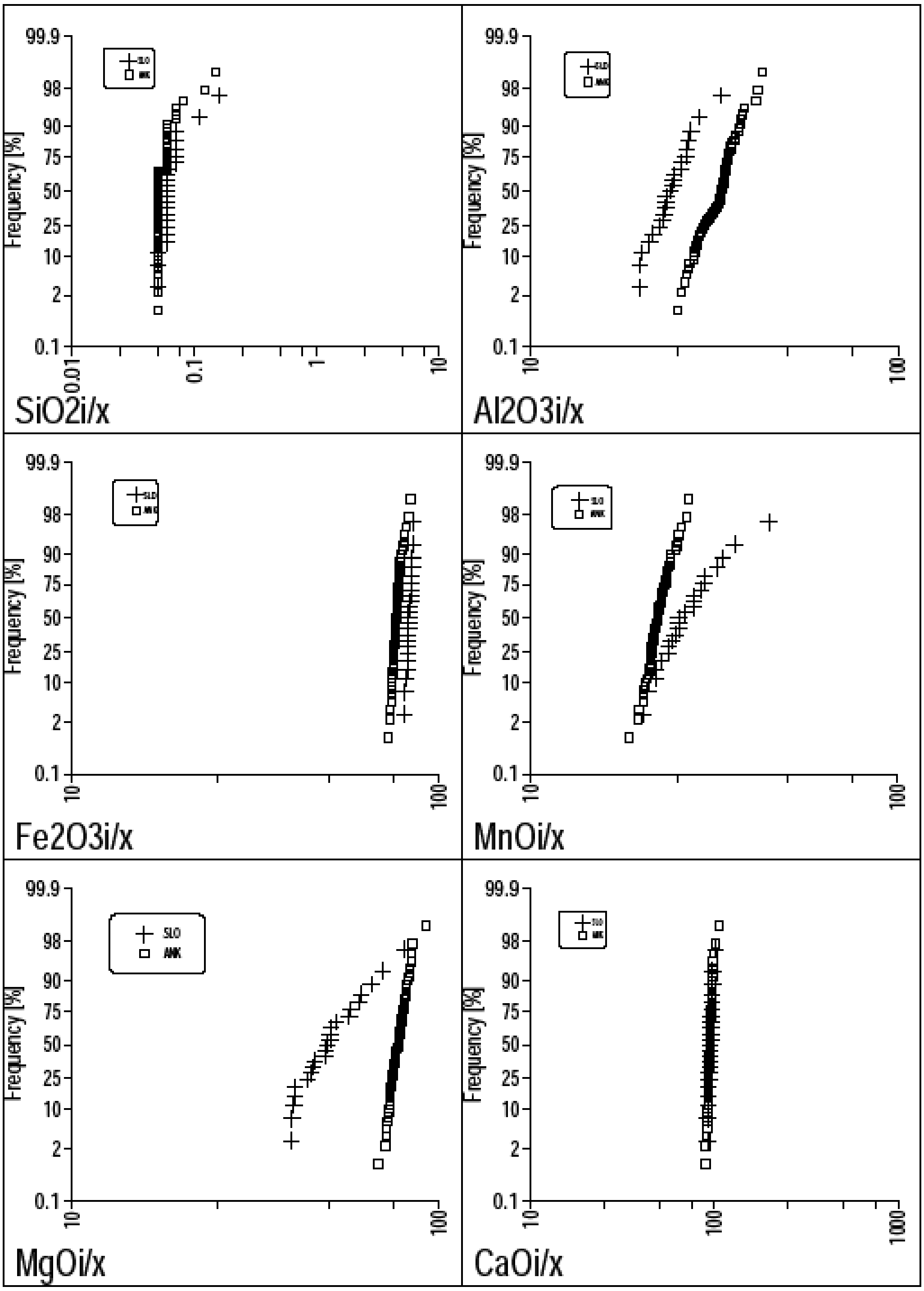

Figure 13a. Cumulative frequency distribution curves of ratios (%) between concentrations determined by ICP-AES divided by those determined by XRF of SiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, and CaO (wt. %) in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

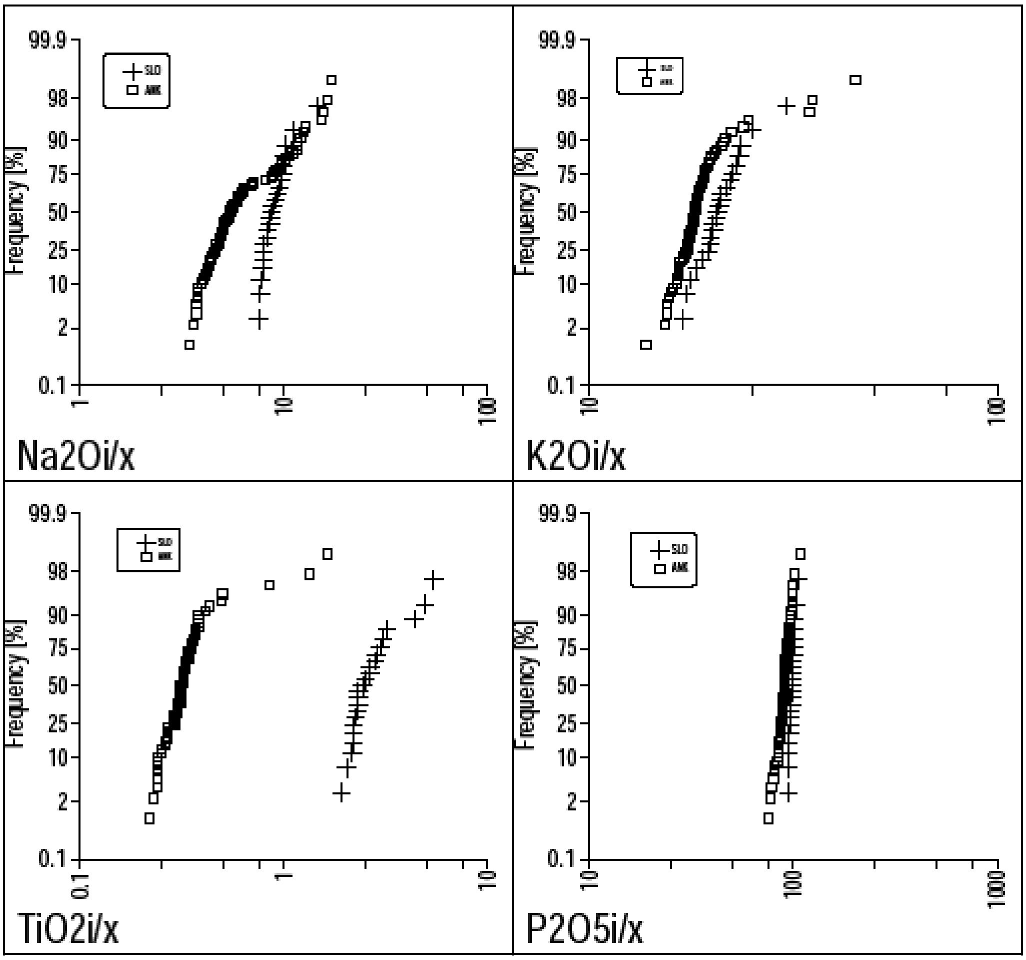

Figure 13b. Cumulative frequency distribution curves of ratios (%) between concentrations determined by ICP-AES divided by those determined by XRF of Na_2O, K_2O, and Ti_2O (wt. %) in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

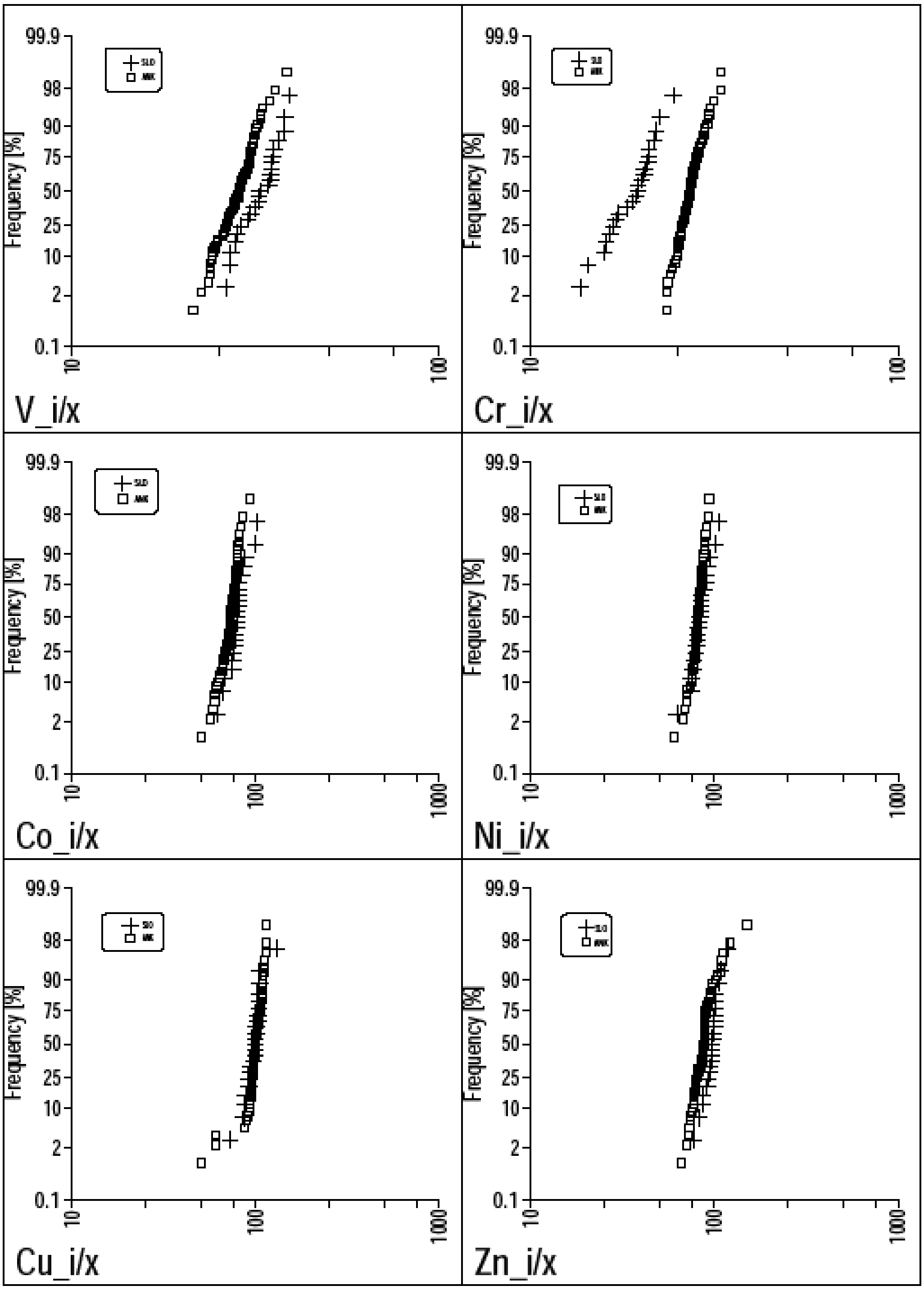

Figure 14a. Cumulative frequency distribution curves of ratios (%) between concentrations determined by ICP-AES divided by those determined by XRF of V, Cr, Co, Ni, Cu, and Zn (mg/kg) in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

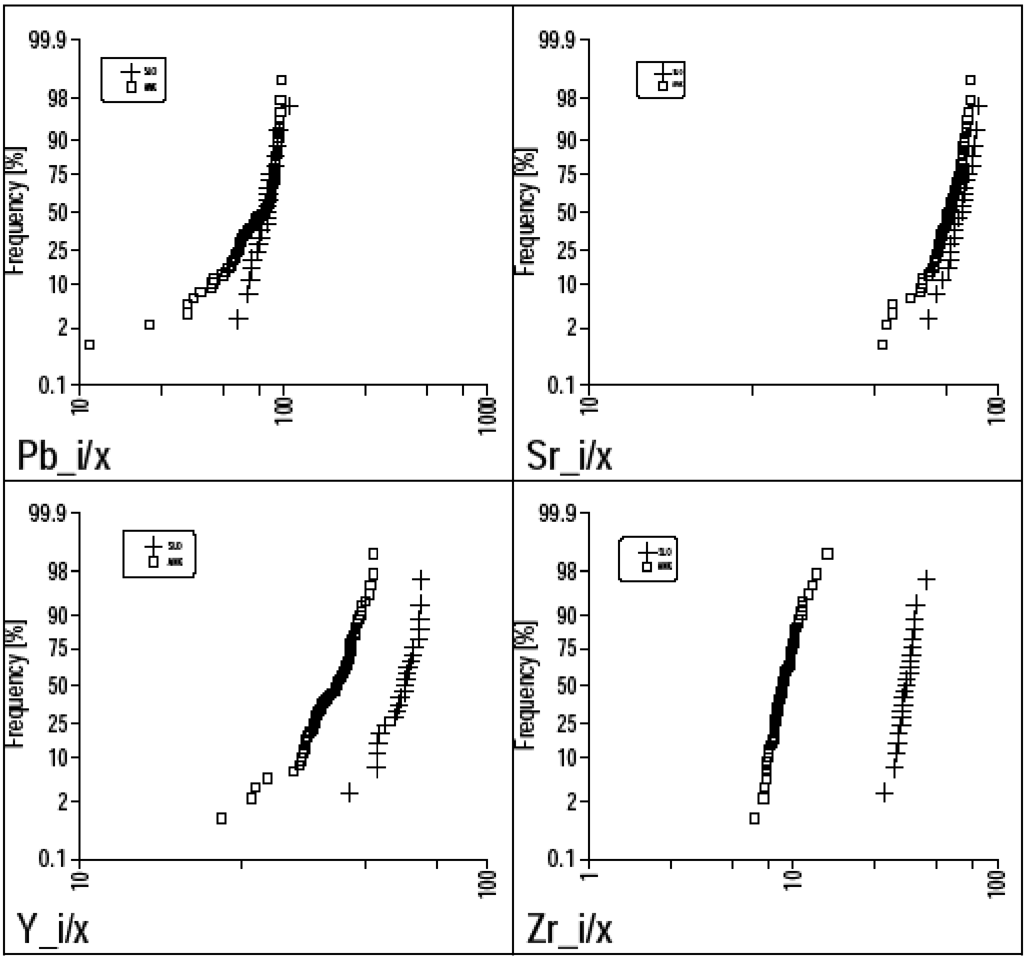

Figure 14b: Cumulative frequency distribution curves of ratios (%) between concentrations determined by ICP-AES divided by those determined by XRF of Pb, Sr, Y, and Zr (mg/kg) in samples from both Ankerskogen and Øvre Slottsgt. in the same diagram for comparison.

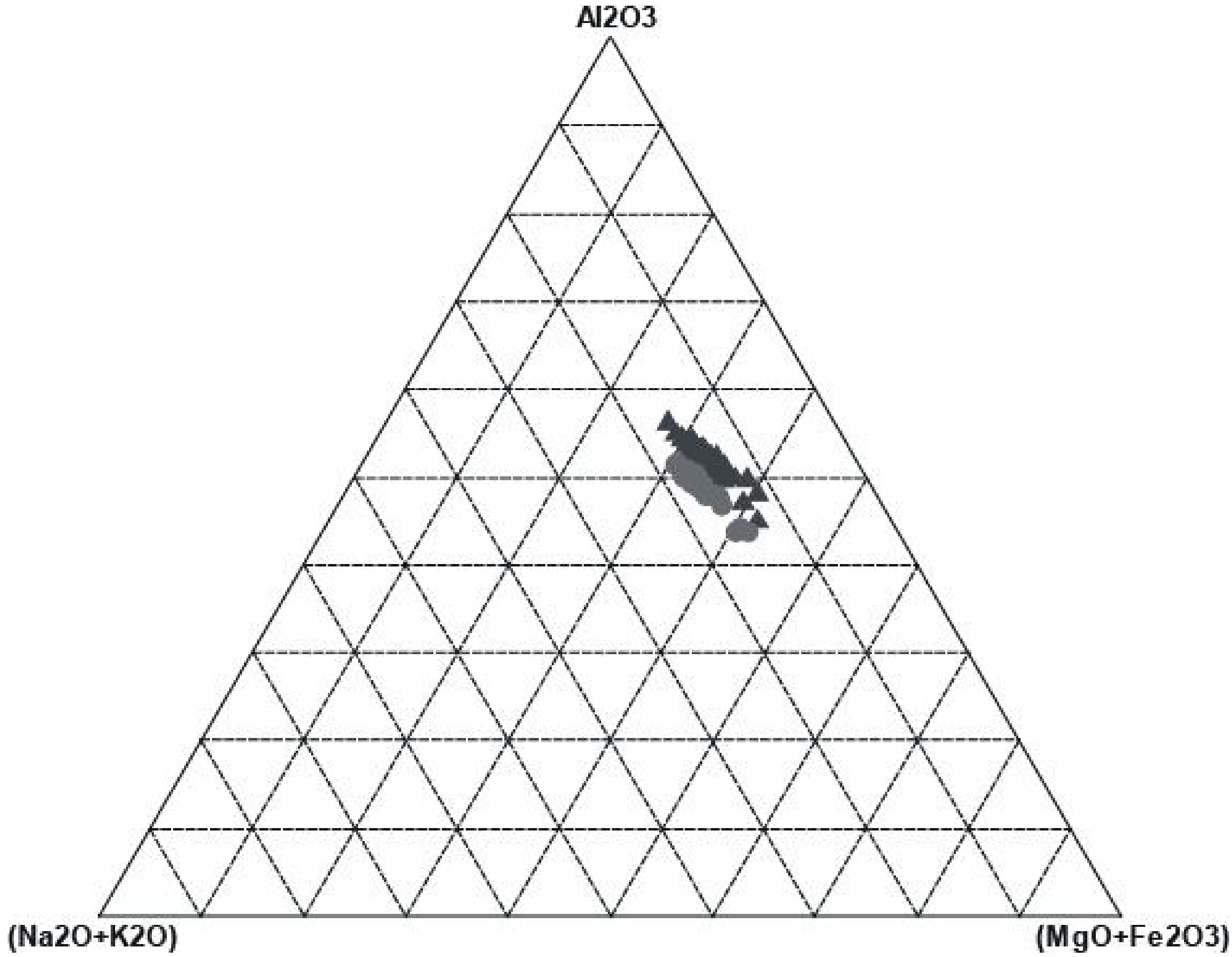

Figure 15. (Na_2O+K_2O)-(MgO+Fe_2O_3)-Al_2O_3 triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

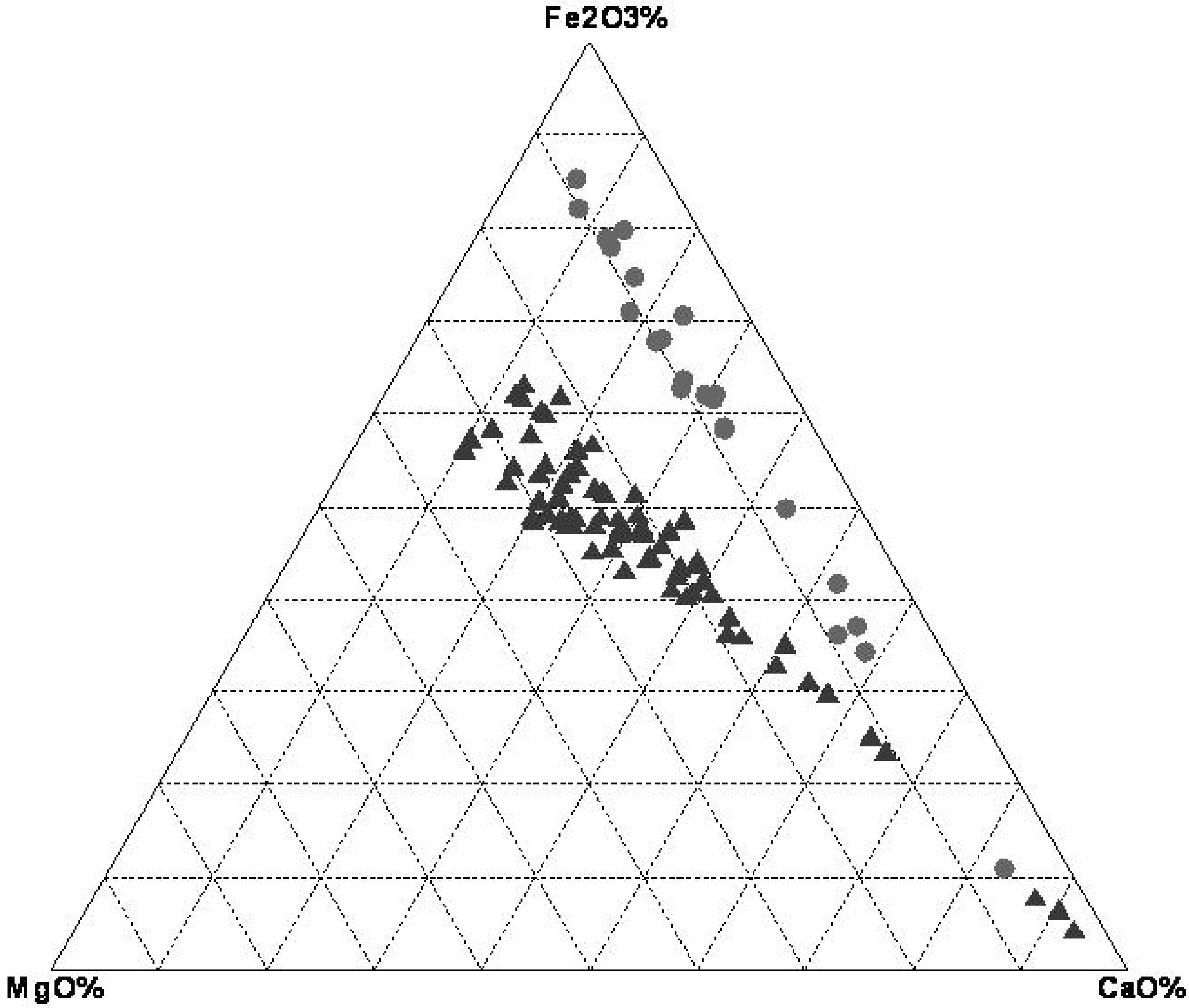

Figure 16. MgO-CaO-Fe_2O_3 triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

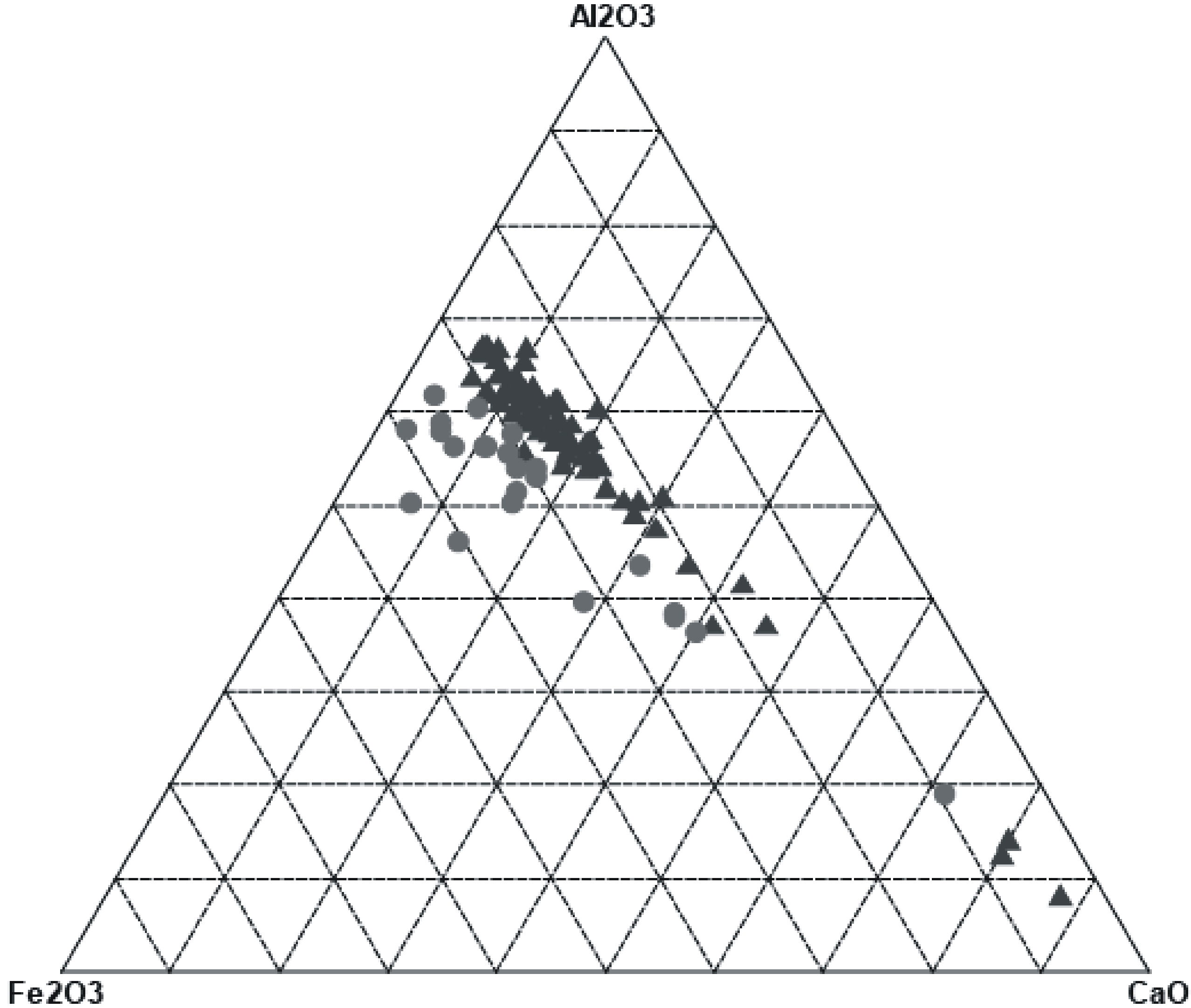

Figure 17. Fe_2O_3-CaO-Al_2O_3 triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

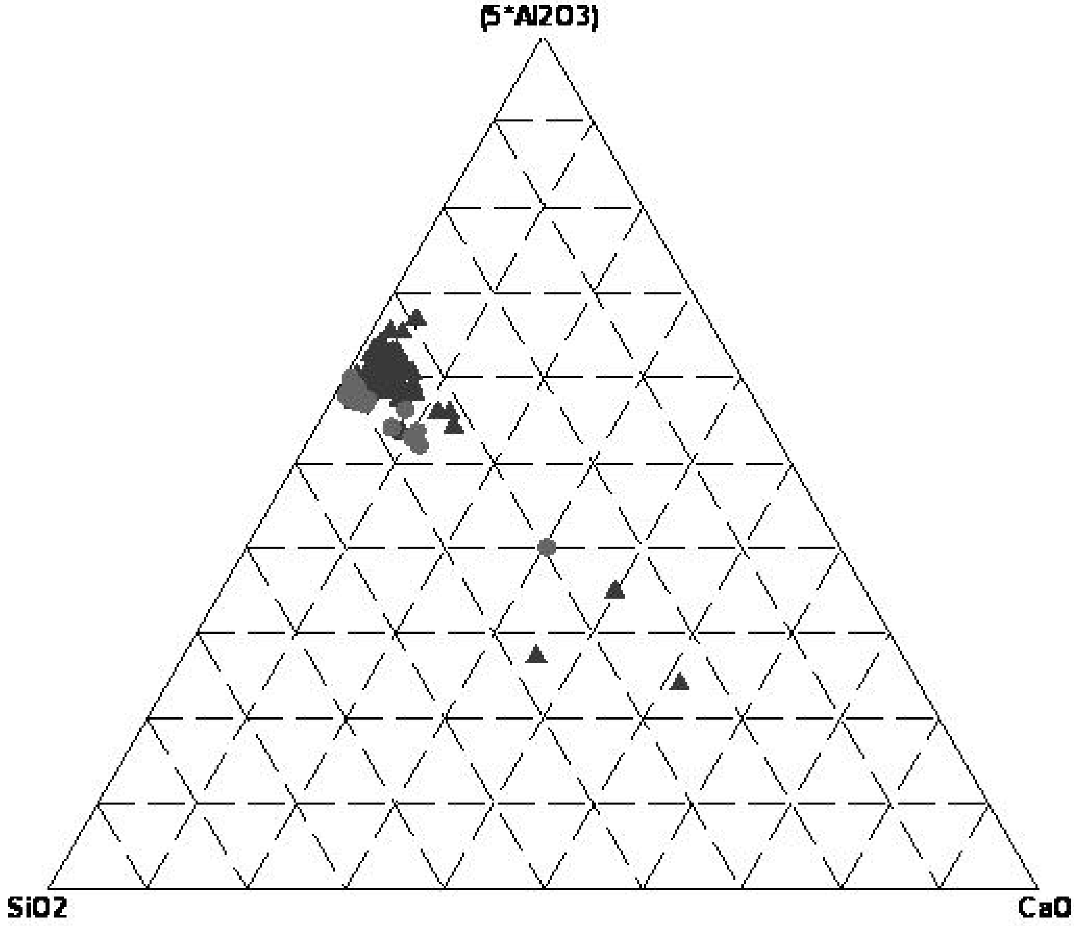

Figure 18. SiO_2-CaO-5xAl_2O_3 triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

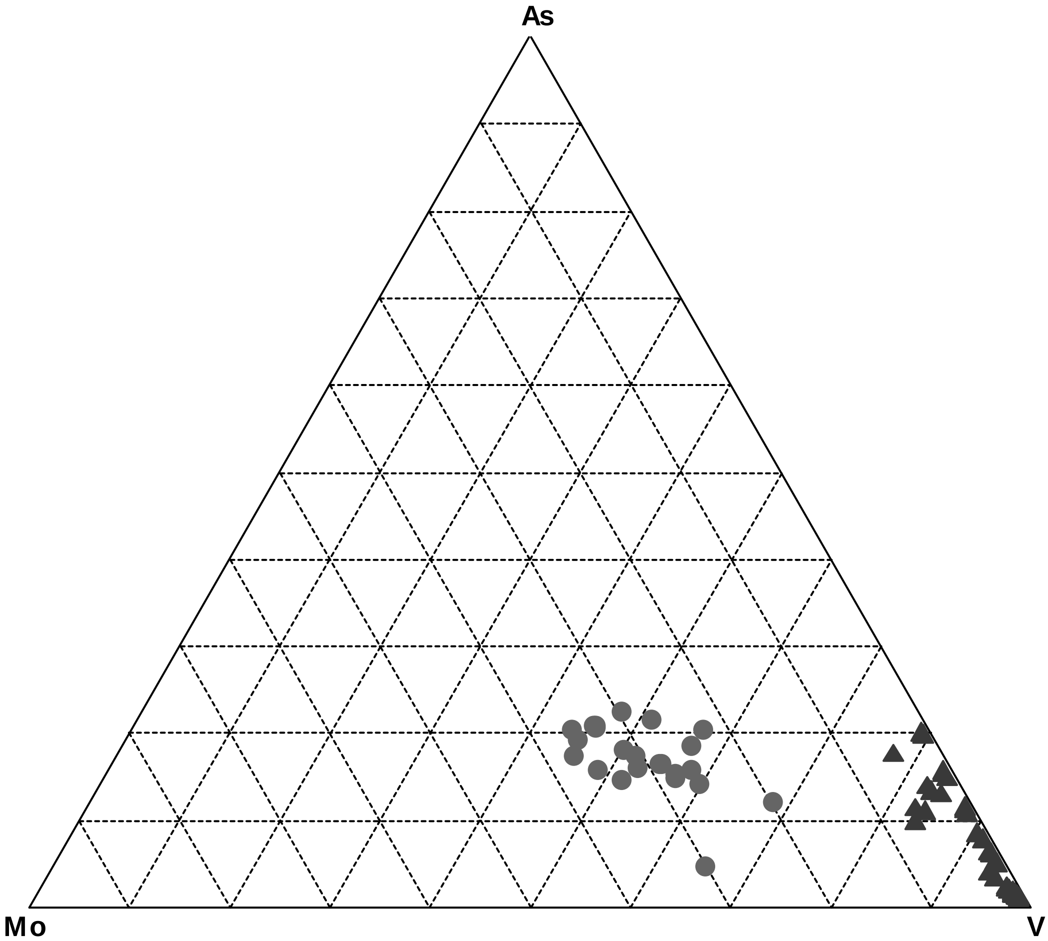

Figure 19. Mo-V-As triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

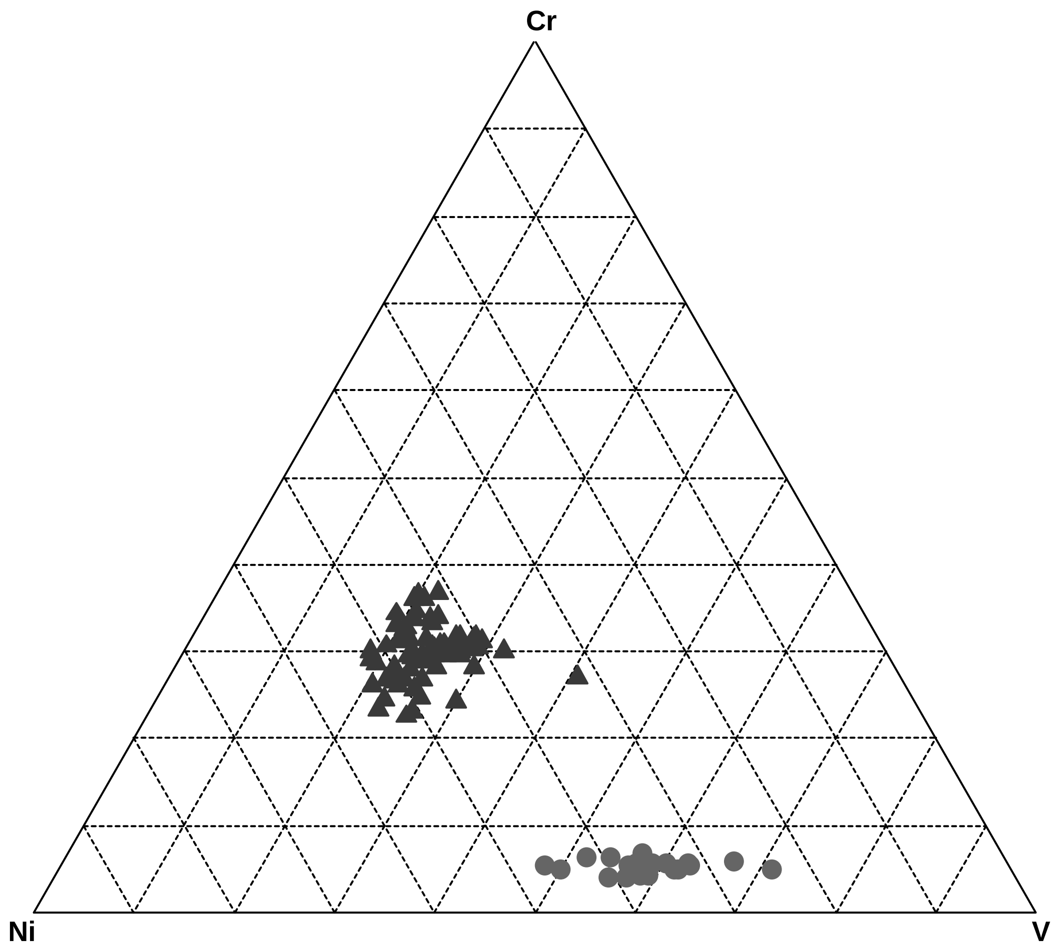

Figure 20. Ni-V-Cr triangular plot showing the compositional variation of analyzed samples.
(▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

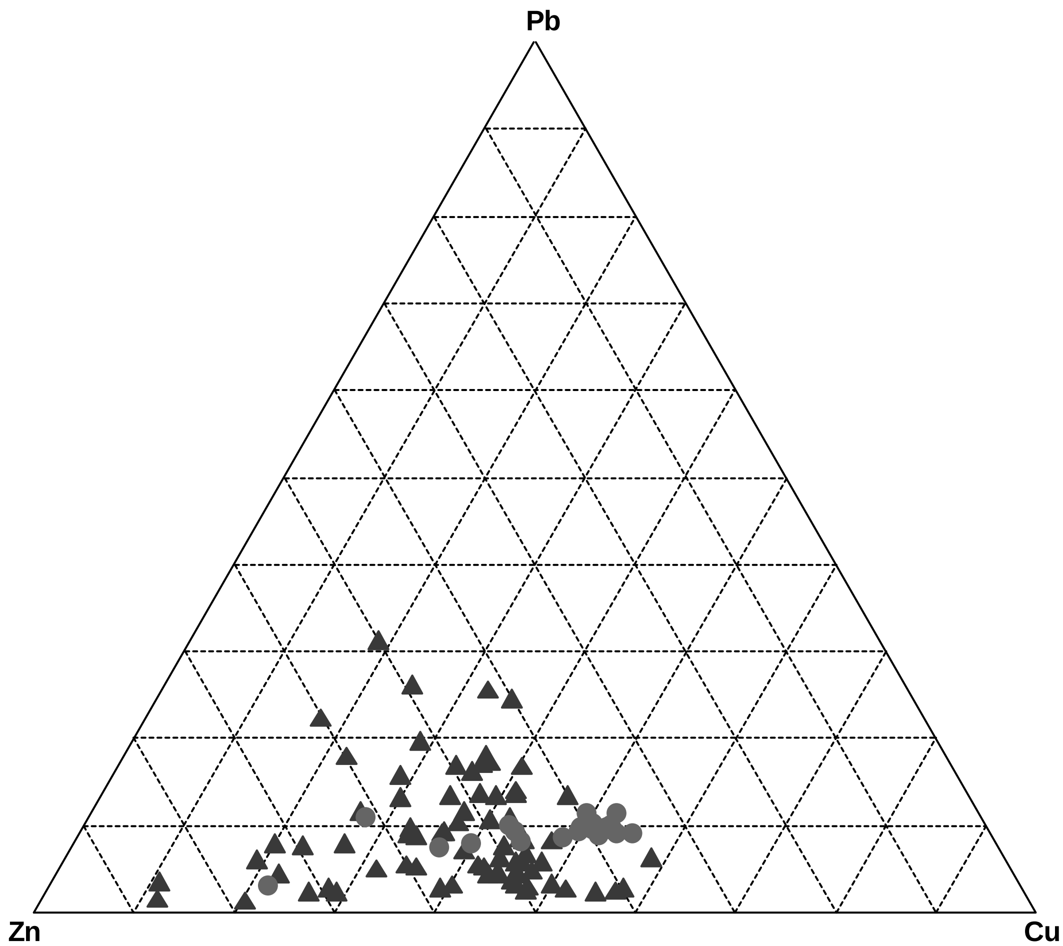

Figure 21. Zn-Cu-Pb triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

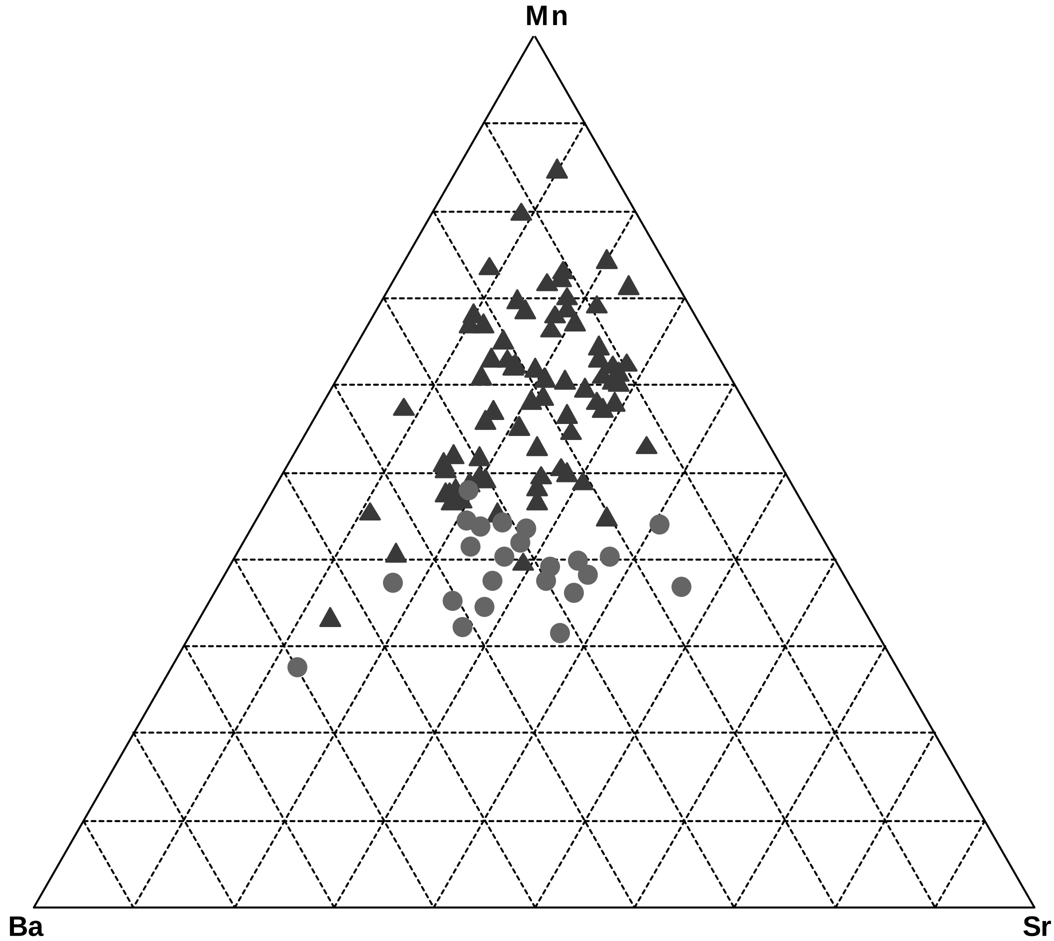

Figure 22. Mn-Ba-Sr triangular plot showing the compositional variation of analyzed samples. (▲ samples from Ankerskogen, ○ samples from Øvre Slottsgt.).

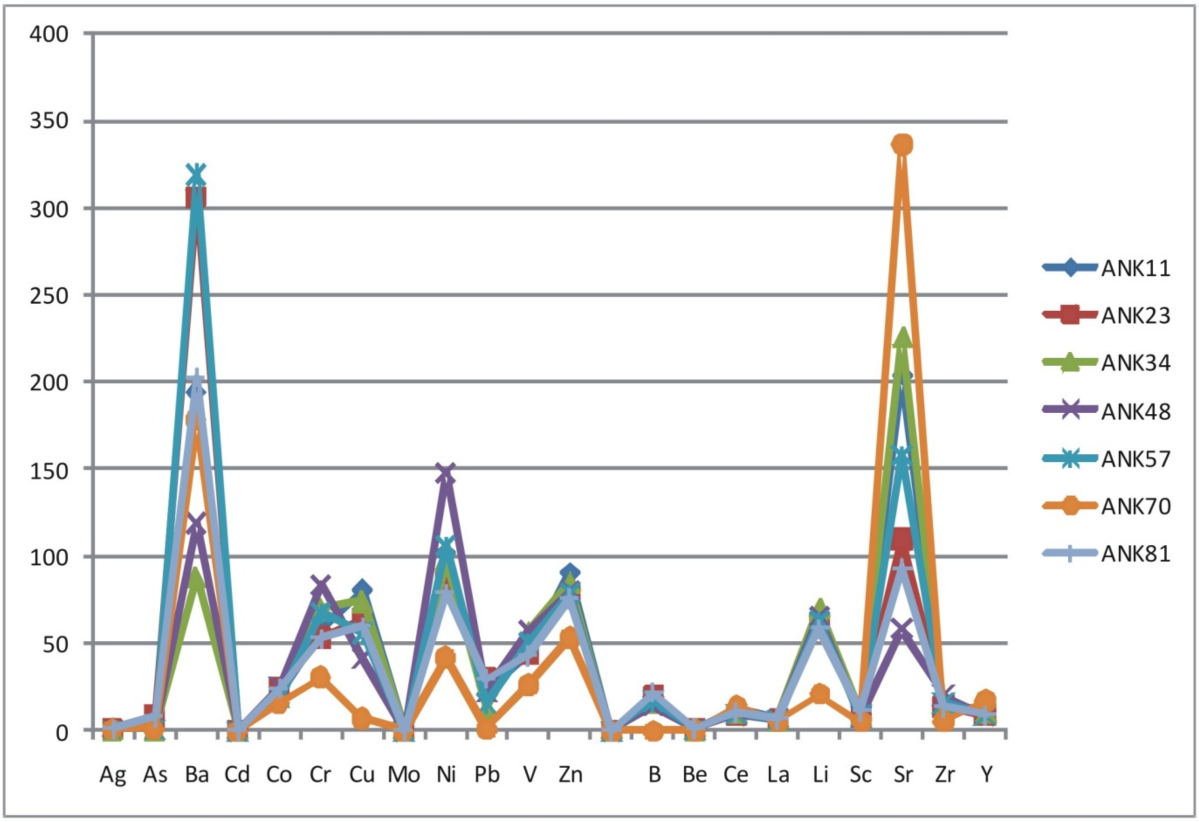

Figure 23a. Scattergraph of metallic/chalcophile and lithophile trace elements for 7 selected samples from Ankerskogen.

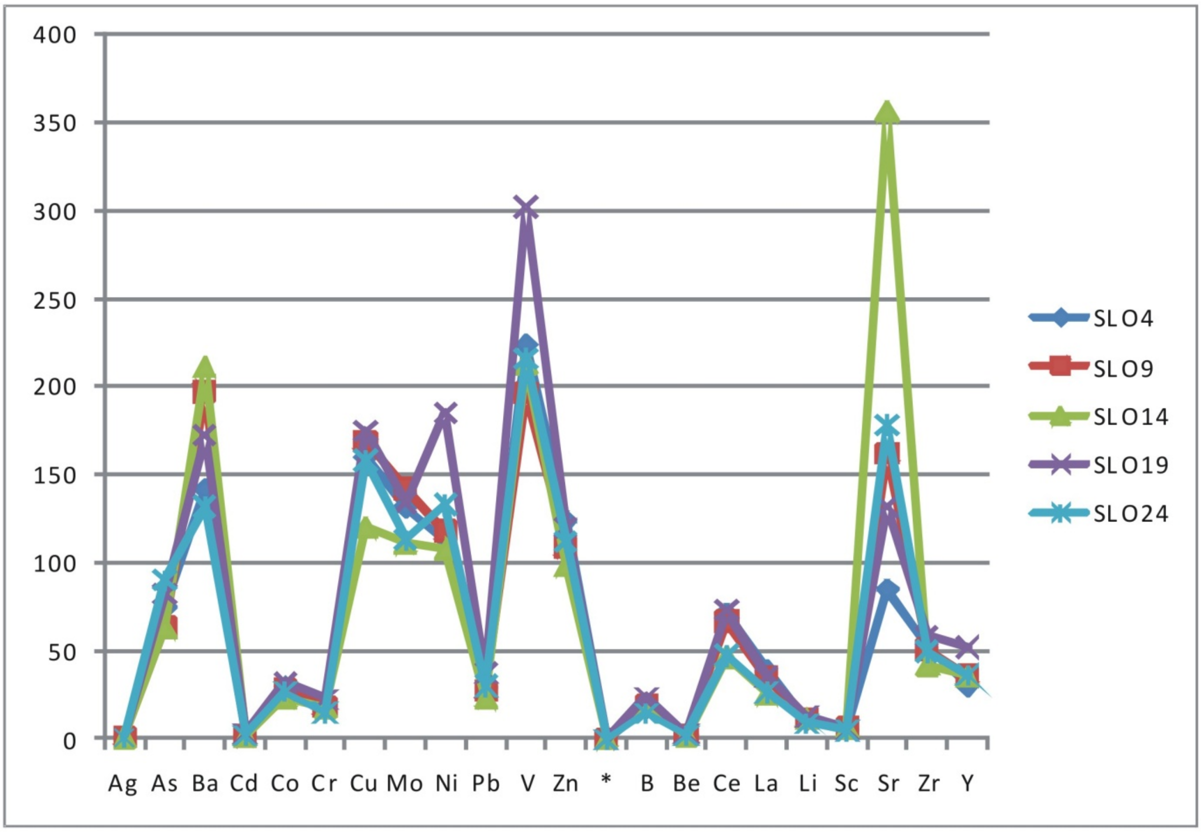

Figure 23b. Scattergraph of metallic/chalcophile and lithophile trace elements for 5 selected samples from Øvre Slottsgt..

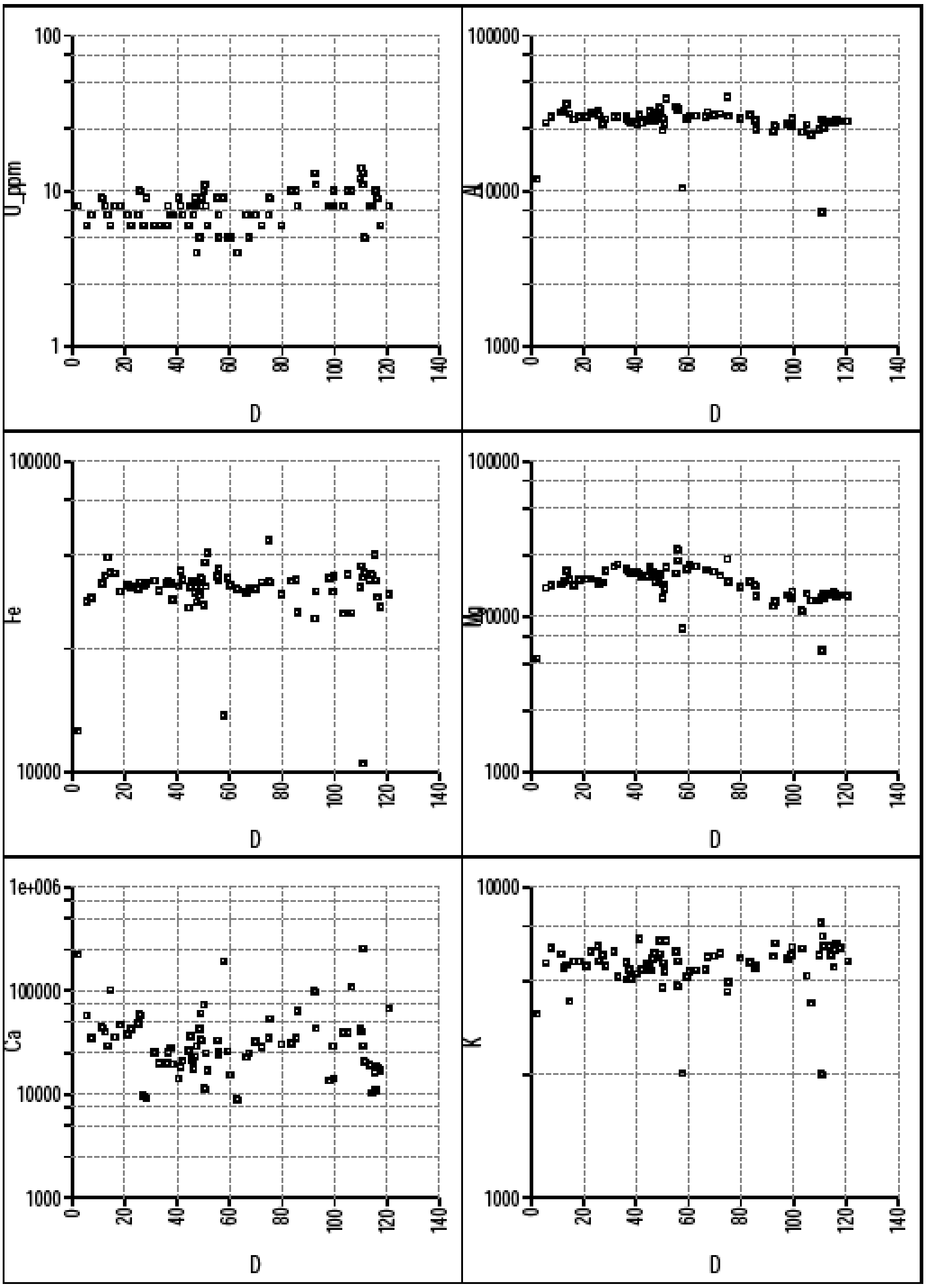

Figure 24a. Concentration of U, Al, Fe, Mg, Ca, and K (mg/kg) in samples from Ankerskogen plotted versus depth (m) in borehole.

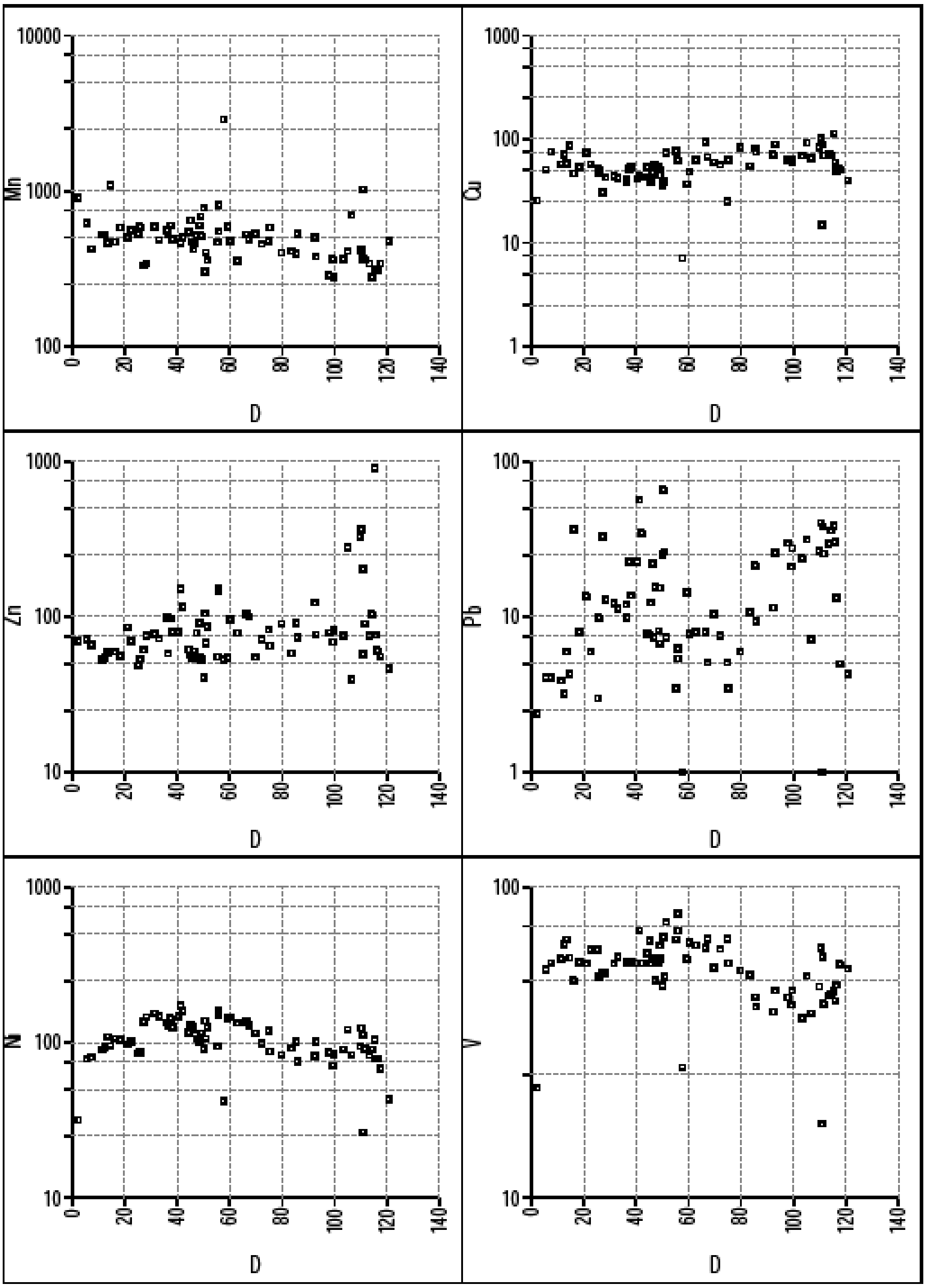

Figure 24b. Concentration of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) in samples from Ankerskogen plotted versus depth (m) in borehole.

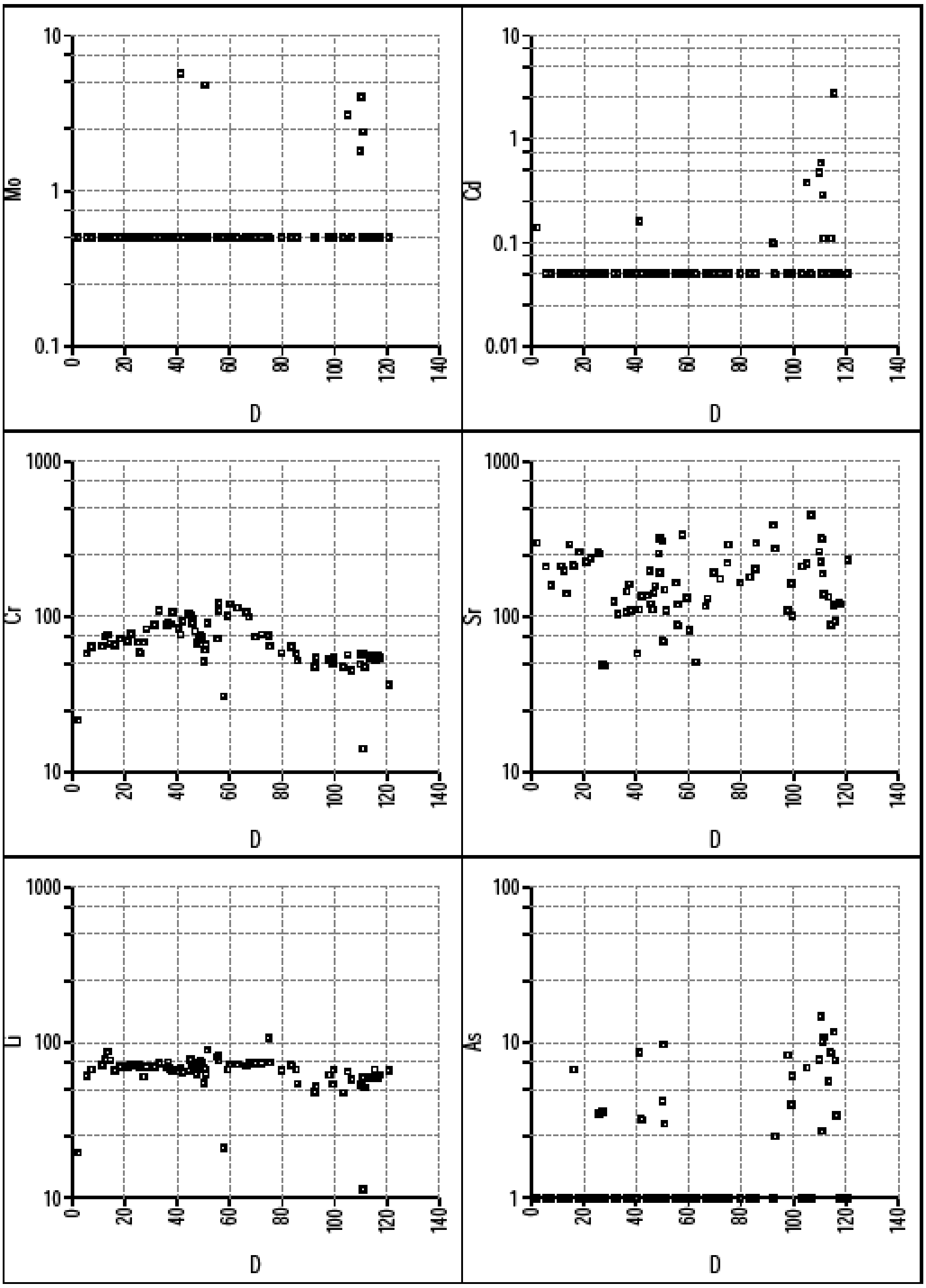

Figure 24c. Concentration of Mo, Cd, Cr, Sr, Li, and As (mg/kg) in samples from Ankerskogen plotted versus depth (m) in borehole.

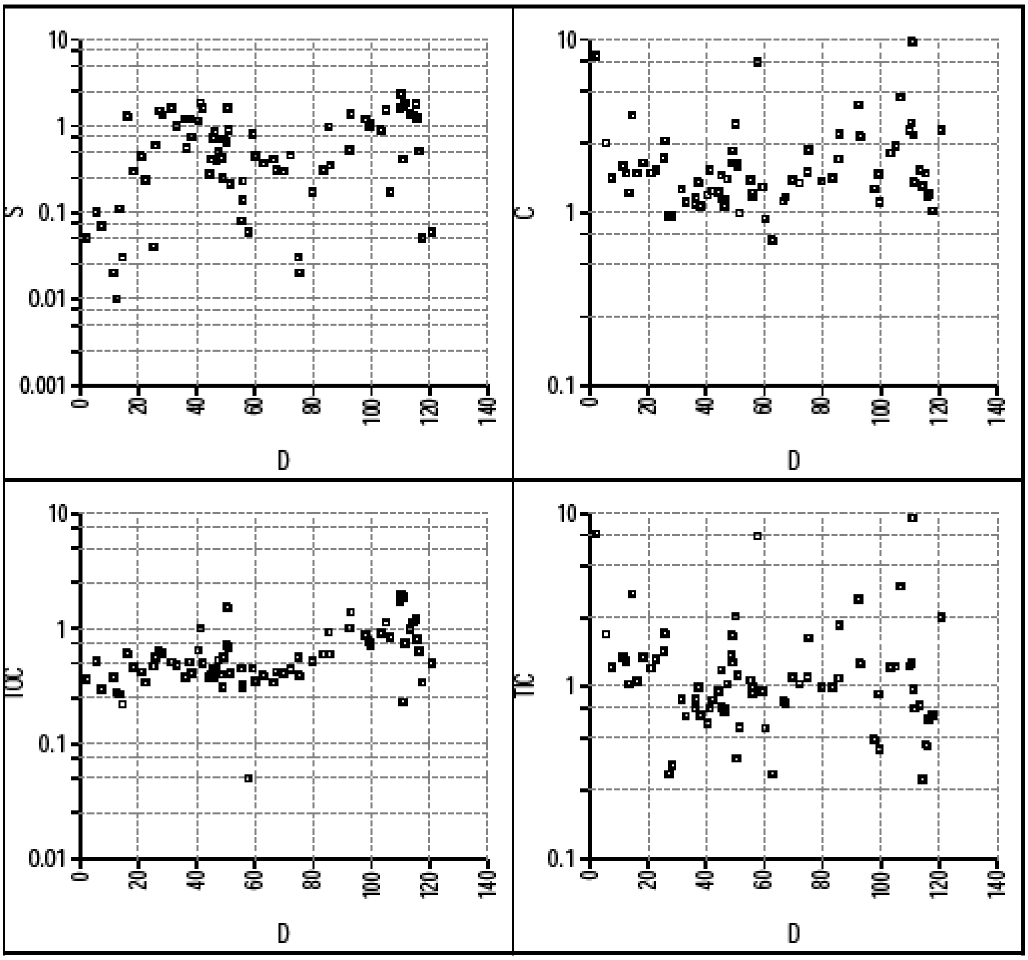

Figure 24d. Concentration of S, C, TOC, and TIC (wt. %) in samples from Ankerskogen plotted versus depth (m) in borehole

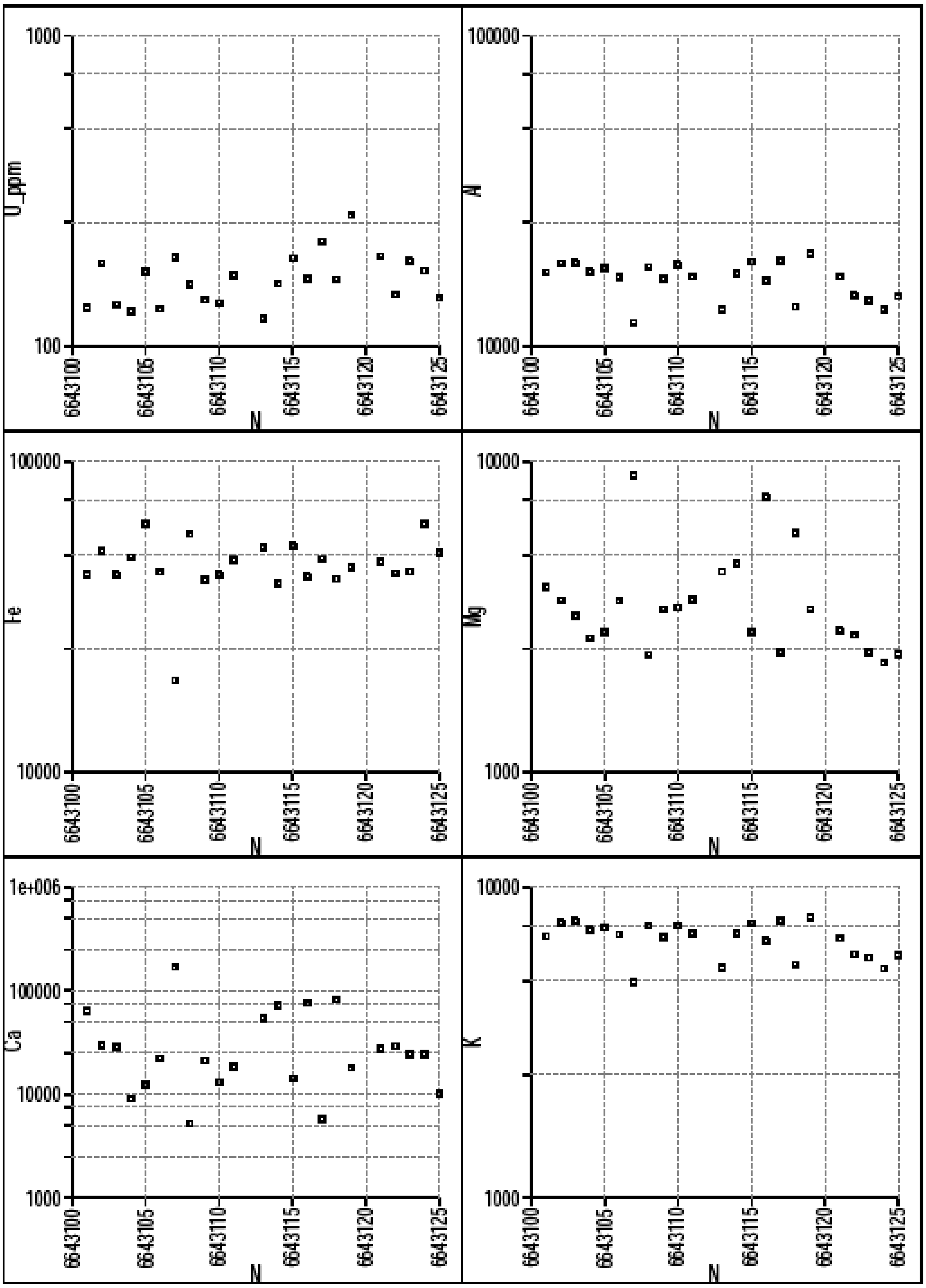

Figure 25a. Concentration of U(ppm=mg/kg), Al, Fe, Mg, Ca, and K (mg/kg) in samples from Øvre Slottsgt. plotted versus distance (m) from SE startpoint in section outcropping below street level.

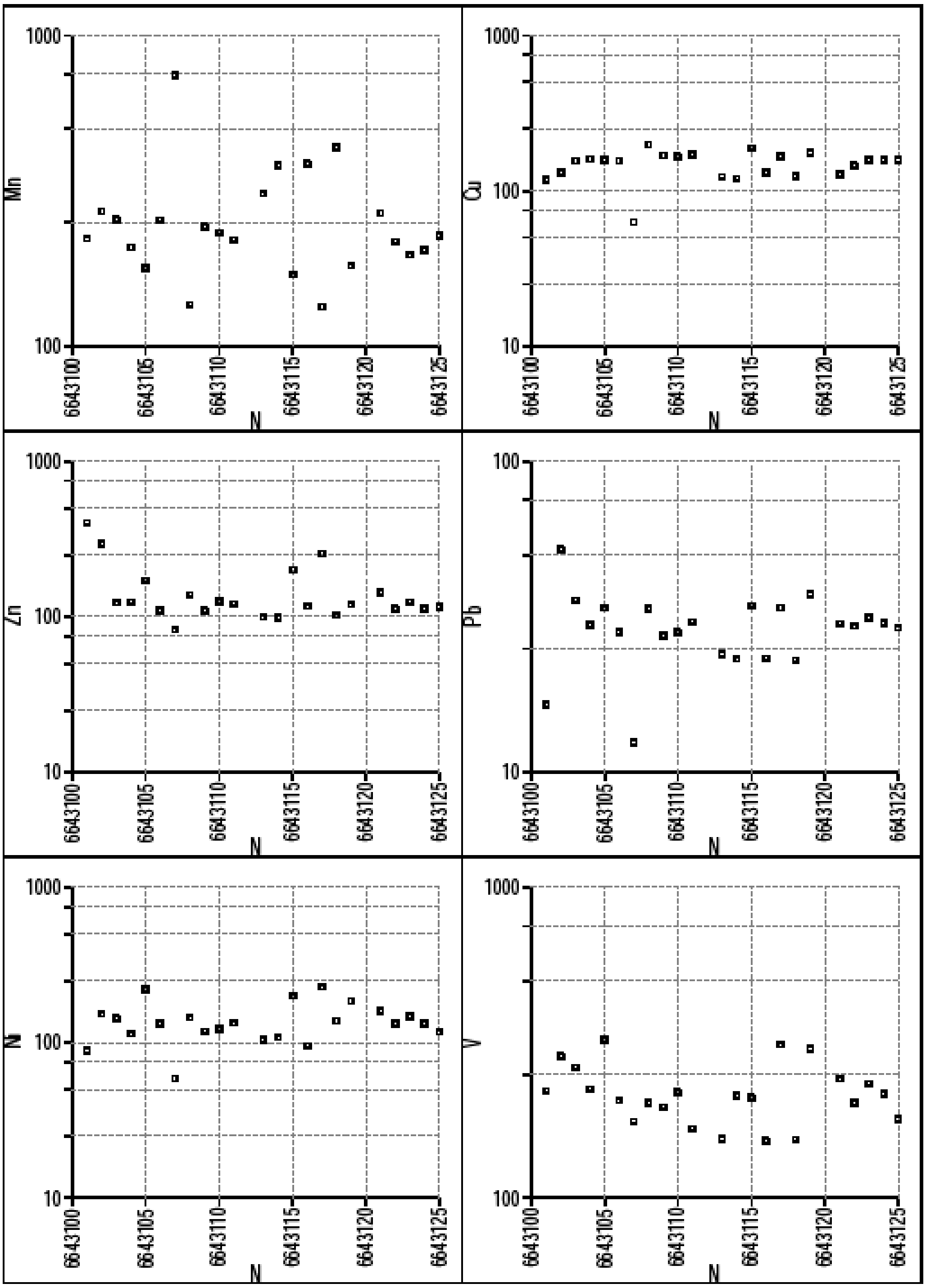

Figure 25b. Concentration of Mn, Cu, Zn, Pb, Ni, and V (mg/kg) in samples from Øvre Slottsgt. plotted versus distance (m) from SE startpoint in section outcropping below street level.

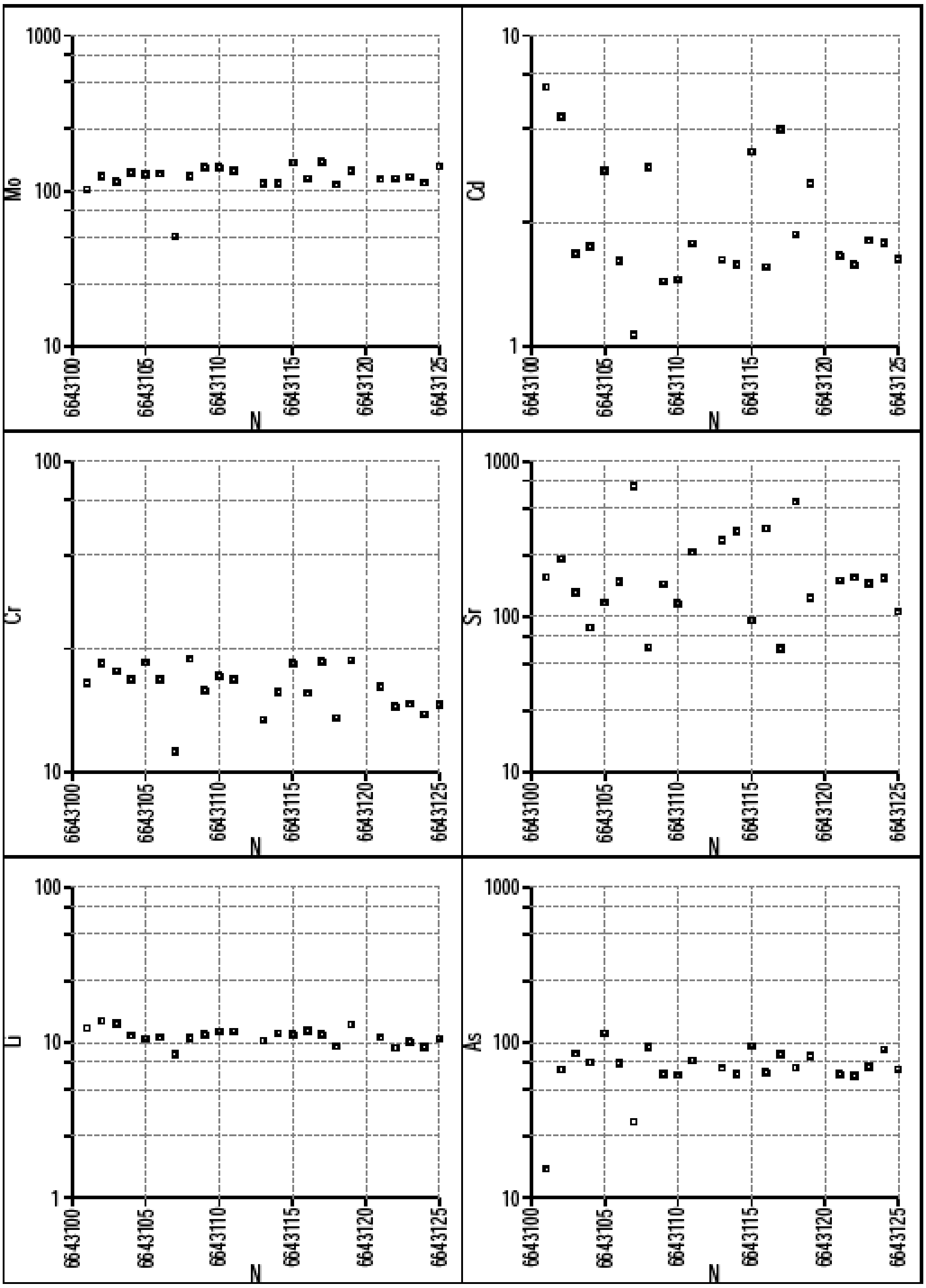

Figure 25c. Concentration of Mo, Cd, Cr, Sr, Li, and As (mg/kg) in samples from Øvre Slottsgt. plotted versus distance (m) from SE startpoint in section outcropping below street level.

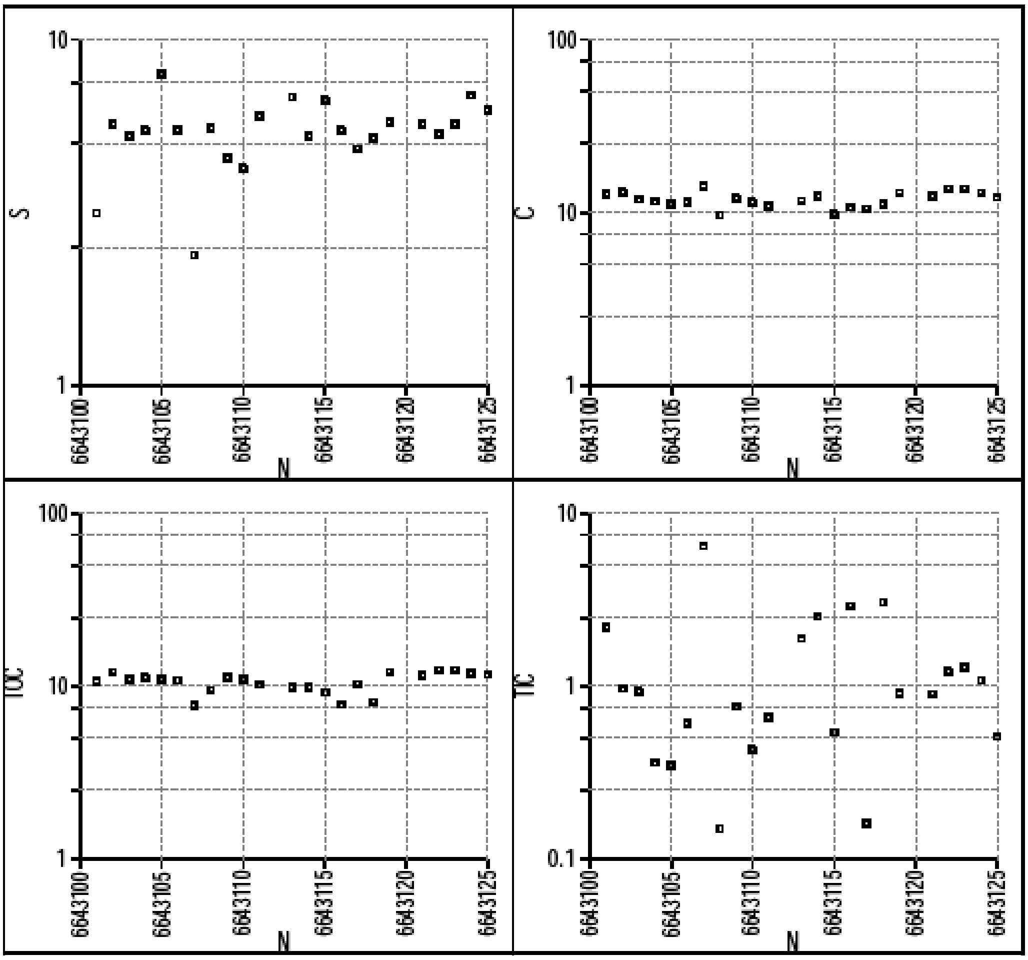

Figure 25d. Concentration of S, C, TOC, and TIC (wt. %) in samples from Øvre Slottsgt. plotted versus distance (m) from SE startpoint in section outcropping below street level.

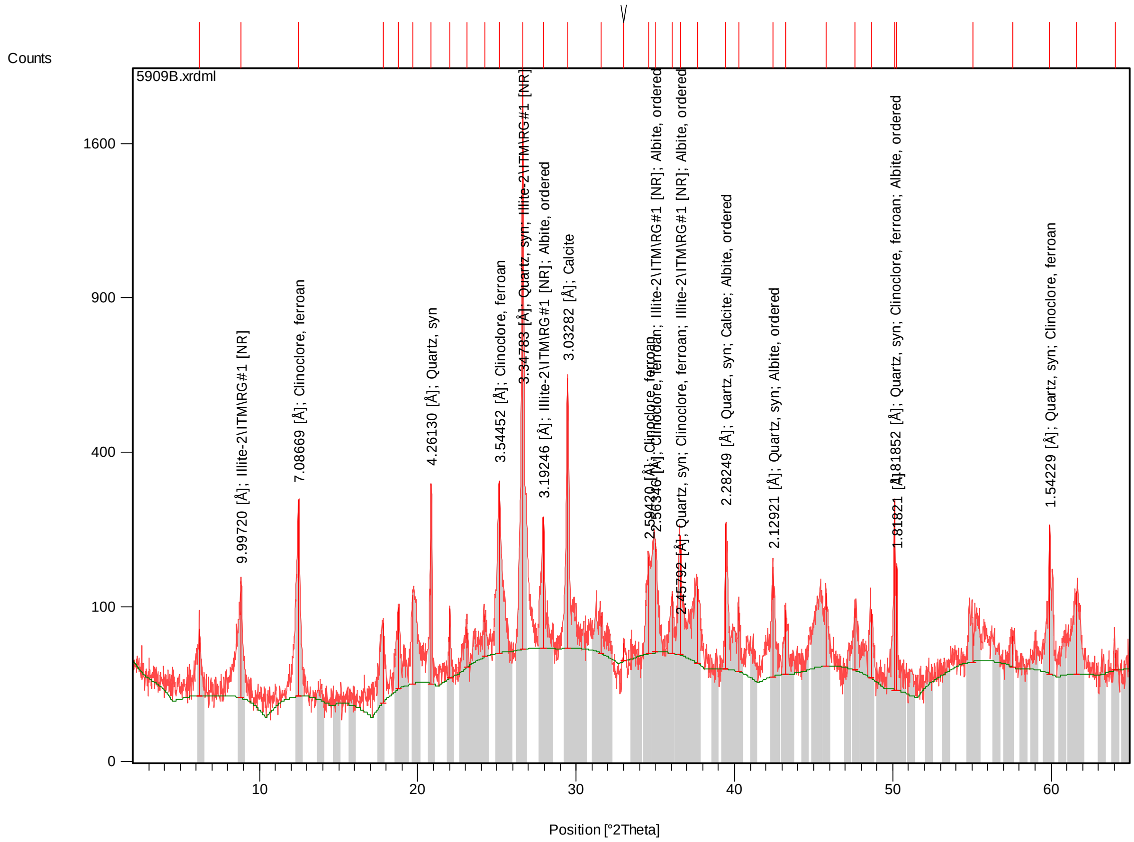

Figure 26. Diffractogram of a typical Ankerskogen sample (HANKER5).

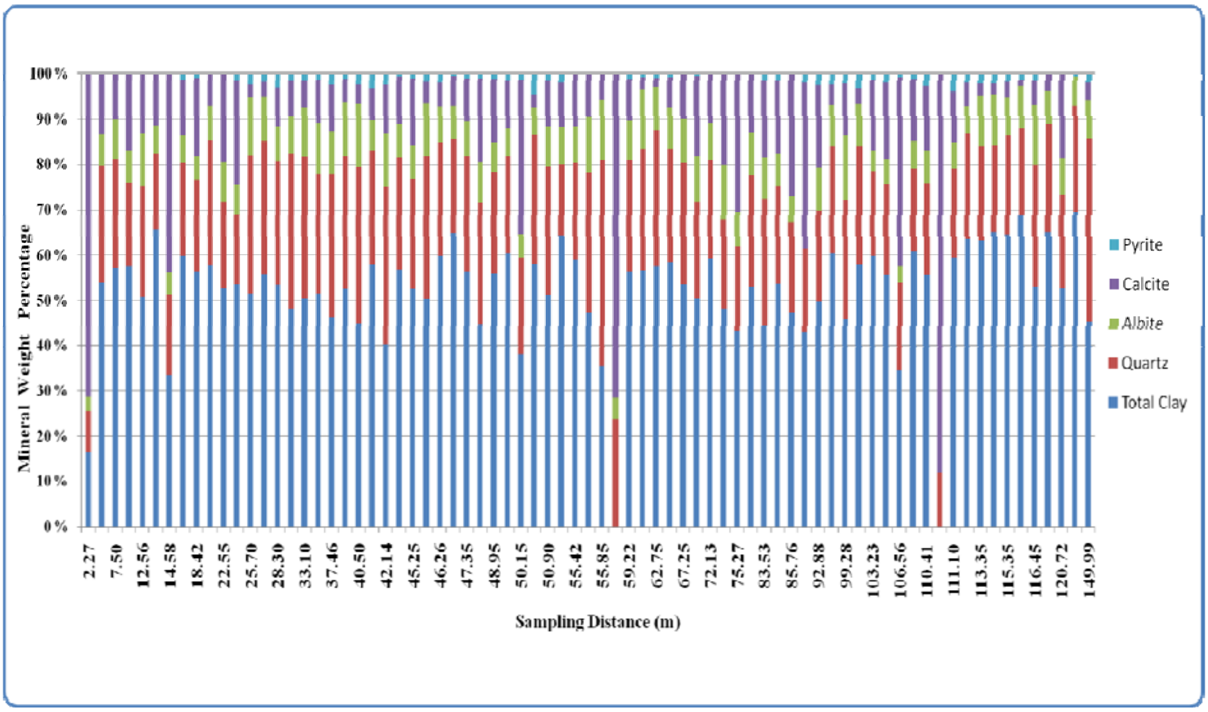

Figure 27. XRD semi-quantitation of samples from Ankerskogen: mineral content (%) vs. sampling distance (samples at 57.65 m interval and 110.78 m interval contain limestone nodules).

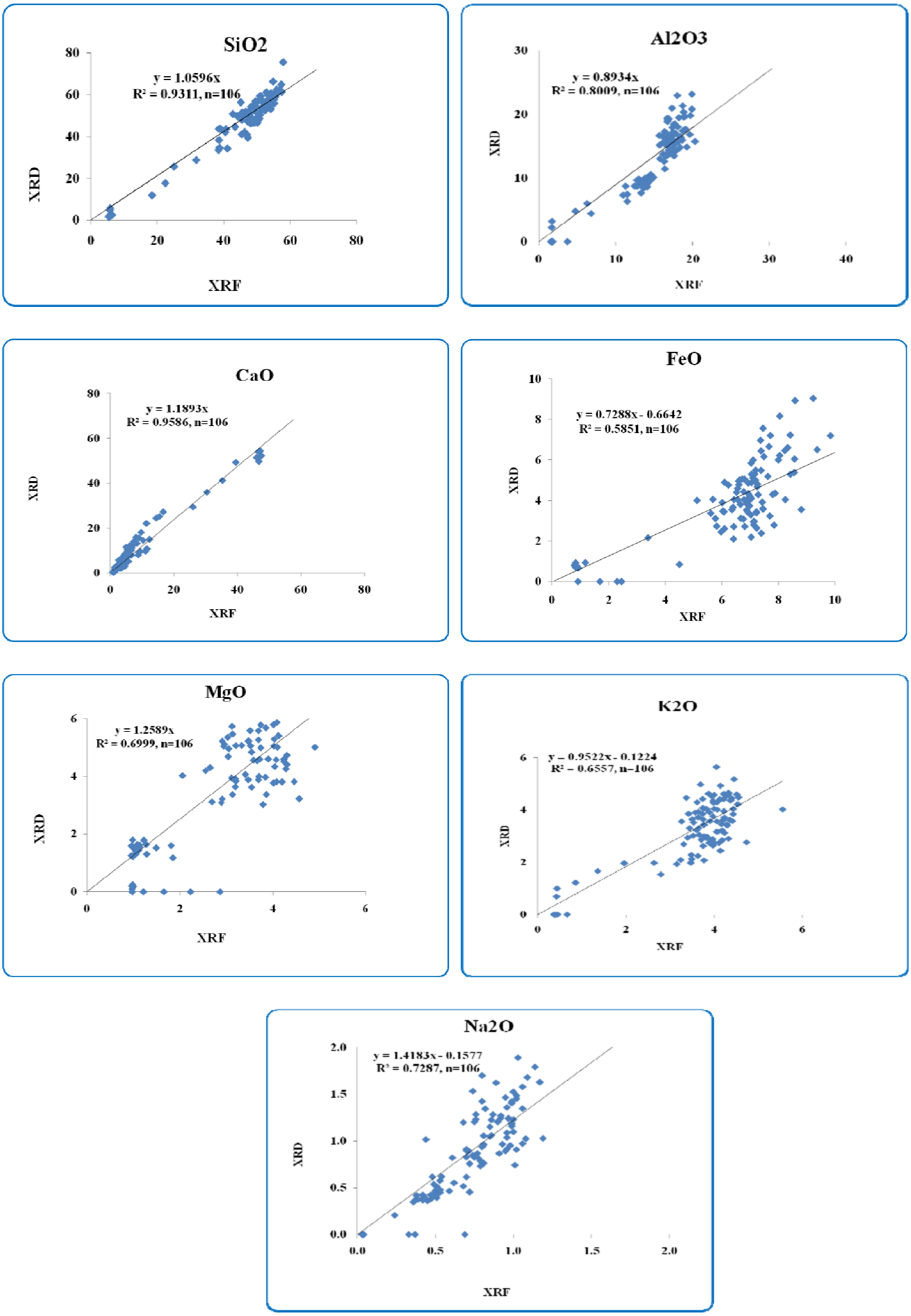

Figure 28. Correlations between XRF and XRD results for chemical constituents (wt. %).

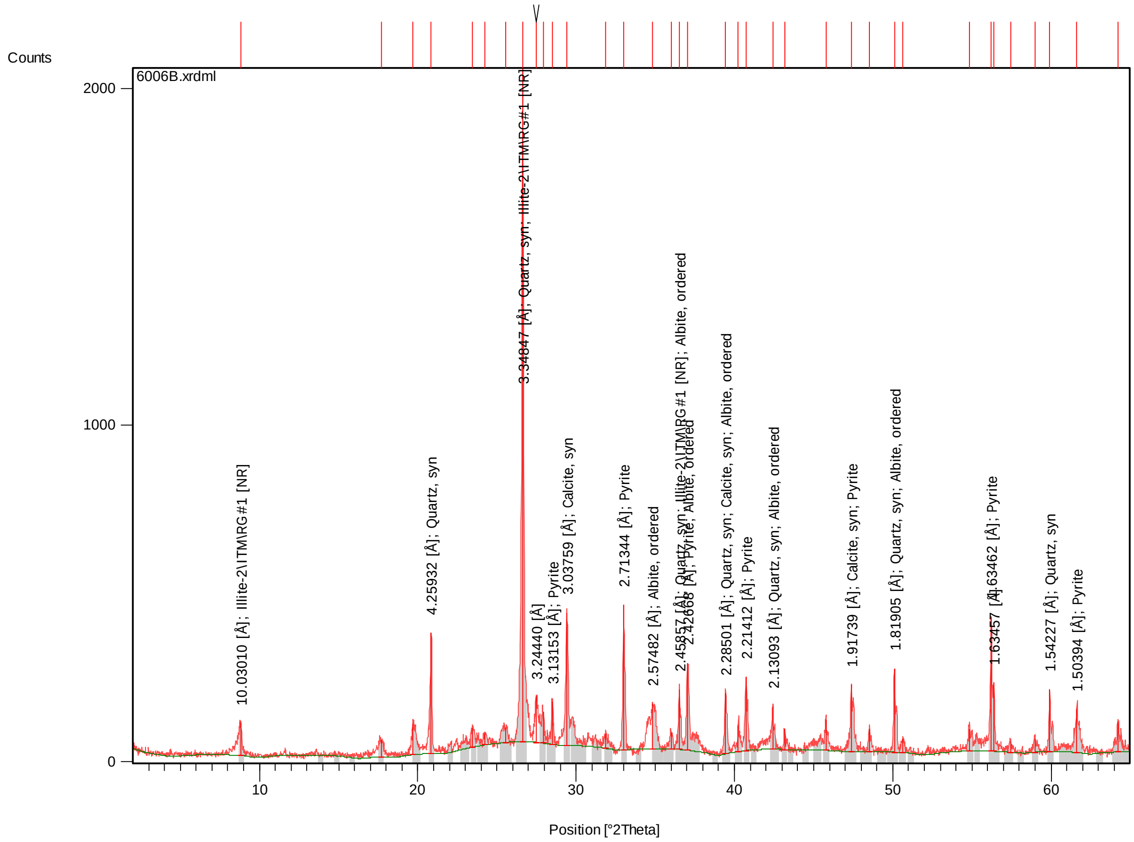

Figure 29. Diffractogram of a typical Øvre Slottsgt. sample (ØS21).

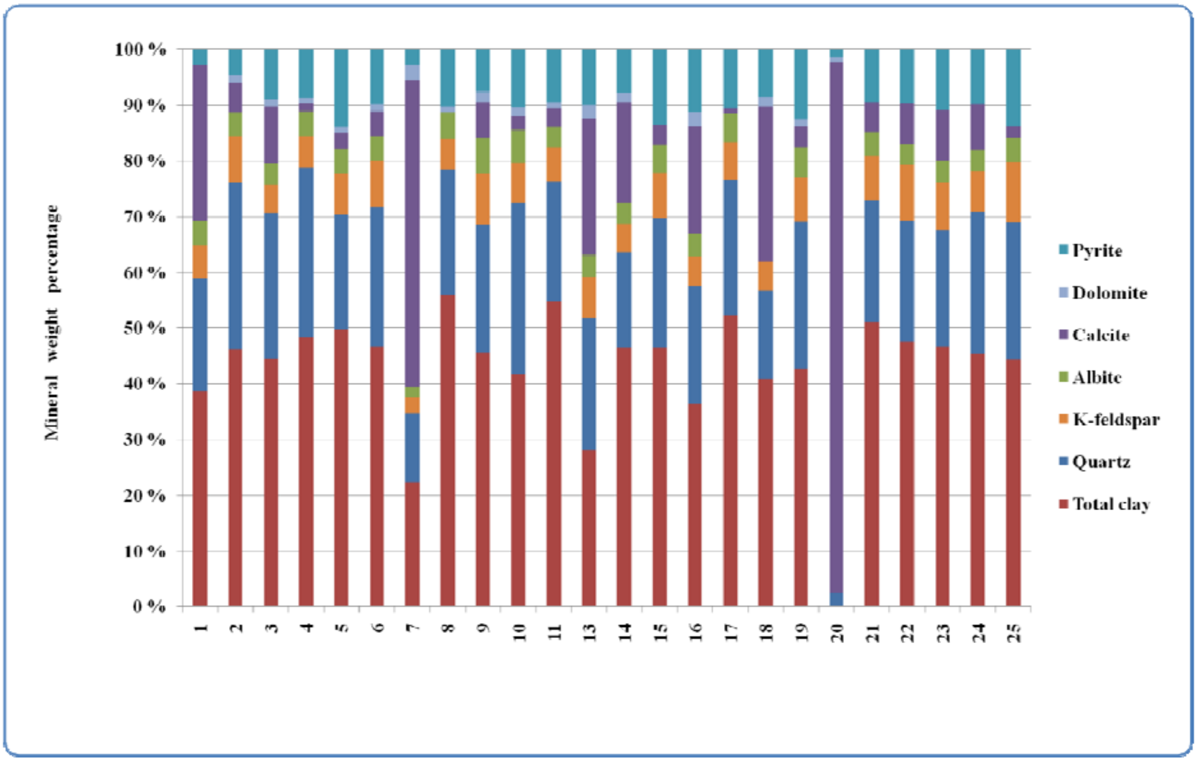

Figure 30. Semi-quantitation for samples from Øvre Slottsgt.: mineral content vs. sampling distance (sample at 20 m distance contains limestone nodules).

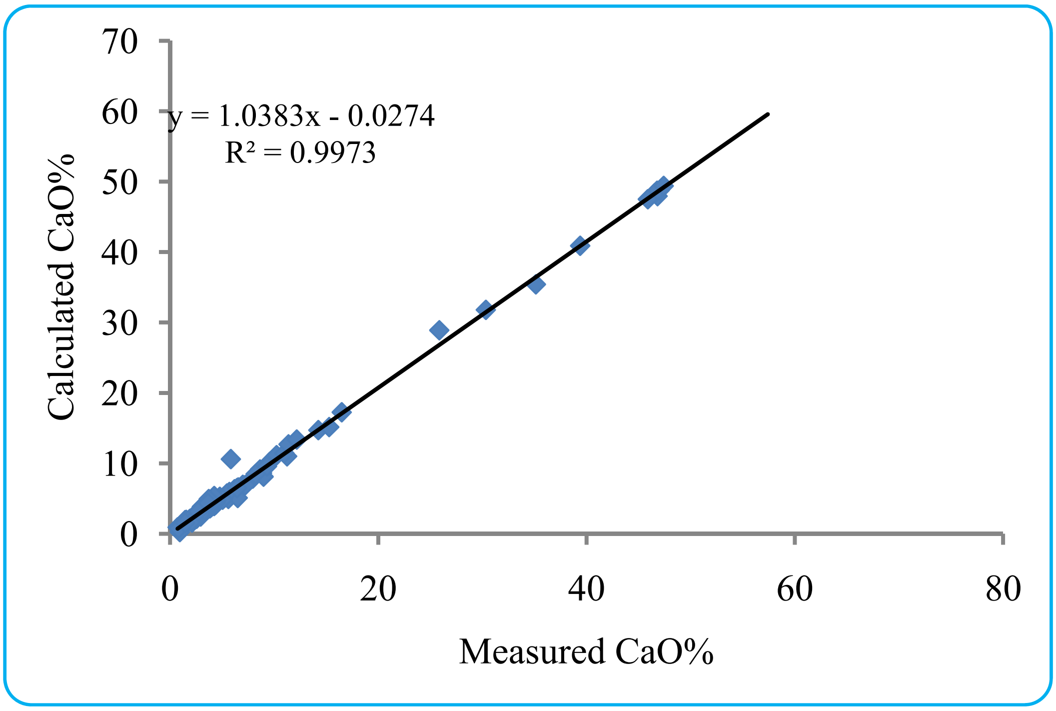

Figure 31. CaO-determined by XRF vs. CaO-calculated from inorganic carbon by LECO® method.

APPENDIX 2:
TABLES

Table 1. Conversion factors for recalculation of element to oxide weight percentages (Fe* to represent total iron content as Fe_2O_3-total)

Element	**Oxide**	**Factor**
Na	Na_2O	1.3480
K	K_2O	1.2047
Mg	MgO	1.6581
Ca	CaO	1.3992
Mn	MnO	0.3265
Fe*	Fe_2O_3	1.4297
Al	Al_2O_3	1.8894
Si	SiO_2	2.1391
Ti	TiO_2	1.6683
P	P_2O_5	2.2916

Table 2. Statistical data of elemental concentrations determined on five duplicates using Leco® and ICP-AES at NGU.

	"REFERENCE"		
Element	Min (n=5)	Max (n=5)	Med (n=5)
Si	125	125	125
Al	3040	3550	3240
Fe	4940	5510	5360
Ti	37.4	41.5	39.4
Mg	5000	5100	5060
Ca	290000	304000	299000
Na	201	248	228.5
K	1380	1550	1430
Mn	680	691	686
P	550	594	587
Cu	17.9	20.7	20.3
Zn	13.9	18.8	14.6
Pb	1	1	1
Ni	14.2	16.6	16
Co	2.52	2.96	2.79
V	61.2	67.9	63.2
Mo	13.3	15.5	14.5
Cd	0.27	0.39	0.32
Cr	3.06	3.46	3.17
Ba	952	971	968
Sr	973	1010	1000
Zr	5.9	6.6	6.3
B	5	5	5
Be	0.55	0.58	0.55
Li	2.79	3.11	2.97
Sc	1.08	1.24	1.16
Ce	14.9	16.4	15.9
La	7.28	7.83	7.64
Y	13.4	14.1	14
As	7.7	10.1	8.7
S	0.13	0.47	0.25
C	13.94	14.41	14.17
TOC	3.29	3.53	3.36
(C-TOC)%	10.58	11.11	10.82

Table 3a. Statistical parameters of elemental concentrations determined by ICP-AES and Leco (S,C,TOC) at NGU.

	ANKERSKOGEN (n=74)					ØVRE SLOTTSGT (n=23)				
Element	Min	Max	Med	1.Quart	3.Quart	Min	Max	Med	1.Quart	3.Quart
Si mg/kg	125	125	125	125	125	125	365	125	125	125
Al mg/kg	7340	40000	29200	18900	30950	11900	19800	16800	14550	18150
Fe mg/kg	10700	55700	40200	38400	42075	19800	62900	45600	43150	51150
Ti mg/kg	10	20	14	14	16	77	228	103	91	117
Mg mg/kg	5420	27200	16850	8350	19475	2260	9000	3340	2730	3755
Ca mg/kg	8890	256000	29400	18500	43050	5220	170000	24500	13700	42100
Na mg/kg	237	934	312	294	439	258	328	300	287	304
K mg/kg	2500	7690	5775	5500	6150	4950	8020	7060	6080	7530
Mn mg/kg	279	2880	482	310	555	134	743	227	201	270
P mg/kg	238	2970	439	317	731	713	1620	1000	892	1145
Cu mg/kg	7	113	56	48	70	63	198	157	130	167
Zn mg/kg	40	907	73	60	91	83	403	121	111	141
Pb mg/kg	1	66	11	8	25	13	52	30	26	34
Ni mg/kg	26	174	105	91	129	59	228	133	116	151
Co mg/kg	7	40	20	18	24	12	33	29	26	31
V mg/kg	17	82	57	52	62	153	324	213	188	238
Mo mg/kg	2	6	4	102	5	51	153	124	114	135
Cd mg/kg	0	3	0	1	0	1	7	2	2	4
Cr mg/kg	14	122	68	23	87	12	23	19	17	22
Ba mg/kg	63	731	167	133	202	132	292	197	174	232
Sr mg/kg	48	455	163	120	226	62	688	169	123	248
Zr mg/kg	5	24	15	14	16	28	62	52	49	58
B mg/kg	13	29	17	16	20	11	24	18	16	20
Be mg/kg	0	1	1	1	1	1	3	2	2	3
Li mg/kg	11	107	67	20	73	8	14	11	10	12
Sc mg/kg	5	13	10	7	11	4	7	6	5	6
Ce mg/kg	8	20	11	10	12	38	73	63	50	69
La mg/kg	4	9	7	6	7	21	39	33	28	36
Y mg/kg	7	25	11	10	13	27	52	35	31	37
As mg/kg	1	15	1	1	3	15	115	69	63	83
S%	0.0	2.3	0.5	0.3	1.2	2.4	8.0	5.5	5.2	5.9
C%	0.7	9.6	1.6	1.4	2.2	9.7	14.2	11.9	11.2	12.9
TOC%	0.1	2.0	0.5	0.4	0.7	7.8	12.4	10.9	9.8	11.6
(C-TOC)%	0.3	9.4	1.0	0.7	1.4	0.2	6.5	0.9	0.5	1.6

Tab 3b. Statistical parameters for main oxide content and trace element concentrations determined by XRF (%= weight %, ppm=mg/kg) and Leco for TC,TOC,TIC) at UiO.

Oxide /	ANKERSKOGEN (n=74)					ØVRE SLOTTSGT (n=23)				
Element	Min	Max	Med	1.Quart	3.Quart	Min	Max	Med	1.Quart	3.Quart
SiO2%	18	57	51	47	54	25	50	46	42	48
Al2O3%	4	20	17	14	18	7	15	13	13	14
Fe2O3%	2	11	8	7	8	3	11	8	7	9
MnO%	0	1	0	0	0	0	0	0	0	0
MgO%	1	5	4	2	4	1	2	1	1	1
CaO%	1	39	4	3	6	1	26	4	2	6
Na2O%	0	1	1	1	1	0	1	0	0	1
K2O%	1	5	4	4	4	2	5	4	4	4
TiO2%	0	1	1	1	1	0	1	1	1	1
P2O5%	0	1	0	0	0	0	0	0	0	0
BaO%	0.02	0.10	0.05	0.05	0.06	0.13	0.20	0.18	0.17	0.19
L.O.I.%	5.8	31.5	7.9	7.2	9.4	17.9	25.9	20.1	19.1	21.3
SUM%	96.3	100.0	98.5	98.1	99.0	91.9	99.5	98.7	98.0	99.1
V ppm	53	266	195.5	188	211.75	472	894	622	582.5	793.5
Cr ppm	43	443	246	122	324.5	70	122	103	95	108
Co ppm	10	48	28	26	33	19	44	36	34.5	40
Ni ppm	38	209	129.5	117	154.5	89	252	157	143.5	179.5
Cu ppm	14	102	55.5	46	68.75	87	191	157	141.5	163
Zn ppm	55	835	85.5	74	97.75	101	436	124	117	147
Rb ppm	56	179	161	148	167	101	175	147	137.5	150.5
Pb ppm	3	73	14.5	12	28.75	21	49	36	34	38
Sr ppm	89	551	209	162	272	90	897	204	151.5	279
Y ppm	21	47	27	25	29.75	39	90	56	51.5	62
Zr ppm	54	214	162	142	183	99	162	145	137.5	151.5
Nb ppm	1	16	13	12	14	11	20	17	15.5	17
Th ppm	1	13	10	9	11	10	17	13	12.5	14
U ppm	4	14	8	7	9	123	264	164	139.5	186.5
Ba ppm	187	935	447.5	421	518.5	1161	1810	1576	1515	1661.5
S ppm	135	14918	3930	2373	8225	15908	53485	39095	36532	41920
TC%	0.7	8.9	1.5	1.2	2.0	8.8	13.2	10.8	10.1	11.6
TOC%	0.1	1.7	0.4	0.4	0.7	7.0	11.6	9.7	9.1	10.6
TIC%	0.2	8.8	0.9	0.6	1.3	0.2	6.2	0.9	0.4	1.5

Tab3c. Statistical parameters for main elements converted to oxide determined by ICP-AES.

	ANKERSKOGEN(n=74)					ØVRE SLOTTSGT (n=23)				
Oxide/Ratio	Min	Max	Med	1.Quart	3.Quart	Min	Max	Med	1.Quart	3.Quart
SiO2ICP%	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Al2O3ICP%	1.4	7.6	5.5	3.6	5.8	2.2	3.7	3.2	2.7	3.4
Fe2O3ICP%	1.5	8.0	5.7	5.5	6.0	2.8	9.0	6.5	6.2	7.3
MnOICP%	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MgOICP%	0.9	4.5	2.8	1.4	3.2	0.4	1.5	0.6	0.5	0.6
CaOICP%	1.2	35.8	4.1	2.6	6.0	0.7	23.8	3.4	1.9	5.9
Na2OICP%	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
K2OICP%	0.3	0.9	0.7	0.7	0.7	0.6	1.0	0.9	0.7	0.9
TiO2ICP%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P2O5ICP%	0.1	0.7	0.1	0.1	0.2	0.2	0.4	0.2	0.2	0.3

Tab3d. Statistical parameters for ratio (%) between content of main oxide determined on acid extracts of solids by ICP-AES (wt. %) and on solid samples by XRF (wt. %).

	ANKERSKOGEN(n=74)					ØVRE SLOTTSGT (n=23)				
Oxide/Ratio	Min	Max	Med	1.Quart	3.Quart	Min	Max	Med	1.Quart	3.Quart
SiO2icp/xrf%	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Al2O3icp/xrf%	25.1	42.8	33.0	26.9	34.4	19.8	33.1	24.0	22.6	26.1
Fe2O3icp/xrf%	72.6	83.6	76.4	75.7	77.5	80.5	84.8	82.6	82.1	83.8
MnOicp/xrf%	18.4	26.9	22.2	21.4	23.1	20.2	44.4	25.3	23.7	29.3
MgOicp/xrf%	68.2	91.9	77.4	71.6	79.4	39.4	80.7	49.4	44.1	57.0
CaOicp/xrf%	89.5	105.0	94.3	93.2	95.9	91.6	101.4	95.0	93.4	96.2
Na2Oicp/xrf%	3.4	17.0	5.4	4.9	8.8	7.5	14.5	8.7	7.9	9.7
K2Oicp/xrf%	13.7	45.0	18.1	17.5	19.2	17.0	30.4	20.6	19.7	22.3
TiO2icp/xrf%	0.2	1.6	0.3	0.3	0.3	1.9	5.4	2.4	2.2	2.9
P2O5icp/xrf%	75.6	107.7	90.1	88.4	93.4	94.1	105.4	98.3	96.2	99.9

Tab3e. Statistical parameters for ratio (%) between trace element concentrations determined on acid extracts of solids by ICP-AES (mg/kg) and on solid samples by XRF (mg/kg) (cont'd).

	ANKERSKOGEN(n=74)					ØVRE SLOTTSGT (n=23)				
Oxide/Ratio	Min	Max	Med	1.Quart	3.Quart	Min	Max	Med	1.Quart	3.Quart
V_i/x%	21.3	38.3	28.5	26.8	30.5	26.2	39.1	32.4	29.5	35.0
Cr_i/x%	23.4	33.0	27.1	23.6	28.2	13.6	24.4	19.6	16.9	20.9
Co_i/x%	50.6	92.3	72.9	70.0	77.0	61.6	101.9	79.3	76.2	81.4
Ni_i/x%	60.0	93.8	81.0	78.5	84.5	62.6	105.5	83.1	79.4	88.6
Cu_i/x%	50.7	114.1	99.4	95.2	105.1	72.3	129.4	99.4	92.5	103.1
Zn_i/x%	65.8	150.0	87.6	81.8	89.5	76.4	119.1	96.6	93.3	100.4
Pb_i/x%	11.1	96.3	80.6	62.3	89.7	59.5	106.3	82.9	74.7	84.7
Sr_i/x%	52.3	86.0	75.6	72.5	81.0	67.8	89.4	82.2	76.6	84.2
Y_i/x%	22.3	52.6	42.5	38.5	46.0	45.7	68.8	62.5	57.7	65.8
Zr_i/x%	6.5	14.7	8.9	8.3	9.8	27.9	45.0	35.7	33.9	38.0

APPENDIX 3:
DATASHEET

*ID	*IDGP	E	N	D	NGU	S%ngu	C%ngu	TOC%ngu	(C-TOC)%ngu	Si	Al	Fe	Ti	Mg	Ca	Na	K	Mn	P	Cu	Zn	Pb	Ni	Co
ANK1	AREA1	612428	6742759	60.3	60701	0.45	0.92	0.35	0.57	125	30500	39900	14.7	21600	15400	277	5350	478	275	48.2	96.0	7.7	146	23.4
ANK2	AREA1	612428	6742759	62.75	60702	0.37	0.69	0.39	0.31	125	30400	38800	15.0	21100	8890	292	5410	357	264	63.4	78.5	8.0	134	17.5
ANK3	AREA1	612428	6742759	66.52	60703	0.41	1.16	0.34	0.82	125	29900	37900	14.7	20100	22900	294	5430	523	240	94.7	104	7.9	136	17.4
ANK4	AREA1	612428	6742759	67.25	60704	0.31	1.22	0.42	0.79	125	32200	38900	15.5	20100	25000	286	5950	487	271	67.3	99.8	5.1	129	17.0
ANK5	AREA1	612428	6742759	69.85	60705	0.30	1.53	0.41	1.13	125	31000	39000	15.3	19500	32500	305	6010	528	276	59.4	55.2	10.4	115	17.4
ANK6	AREA1	612428	6742759	72.13	60706	0.46	1.48	0.44	1.03	125	31300	40800	14.7	18400	28600	293	6150	455	315	56.6	72.0	7.5	99.4	15.9
ANK7	AREA1	612428	6742759	74.85	60707	0.03	1.70	0.57	1.13	125	40000	55700	12.0	23500	35300	237	4610	476	1000	25.0	82.5	5.1	120	16.7
ANK8	AREA1	612428	6742759	75.27	60708	0.02	2.29	0.39	1.90	125	30300	40900	12.9	16700	53700	282	4940	581	809	62.9	65.2	3.5	87.8	14.4
ANK9	AREA1	612428	6742759	79.68	60709	0.17	1.51	0.52	0.99	125	29200	37400	11.5	15600	30500	276	5920	400	882	83.1	90.0	6.0	83.6	16.5
ANK10	AREA1	612428	6742759	83.53	60710	0.31	1.59	0.60	0.99	125	30800	41200	13.6	16900	30900	287	5730	410	1230	54.9	58.5	10.6	92.0	22.5
ANK11	AREA1	612428	6742759	85.33	60711	0.98	2.04	0.93	1.11	125	28500	41600	11.0	15900	35100	281	5500	392	608	80.8	90.7	21.3	102	20.7
ANK12	AREA1	612428	6742759	92.28	60712	0.53	4.21	1.01	3.21	125	24000	31200	14.8	11700	98800	302	6000	503	733	70.2	123	11.4	82.3	18.9
ANK13	AREA1	612428	6742759	92.88	60713	1.38	2.75	1.39	1.35	125	26100	38200	13.4	12600	43300	442	6610	377	1030	89.0	76.7	25.9	102	24.0
ANK15	AREA1	612428	6742759	99.29	60715	1.00	1.67	0.77	0.90	125	26100	38000	13.1	13300	29300	666	6040	365	1010	63.1	68.7	21.0	71.2	19.6
ANK16	AREA1	612428	6742759	99.52	60716	1.05	1.15	0.72	0.43	125	29400	42800	13.6	14500	14300	806	6420	279	1440	60.1	81.5	27.6	83.8	23.0
ANK17	AREA1	612428	6742759	103.23	60717	0.90	2.21	0.92	1.29	125	23900	32400	10.2	10900	39900	873	6350	366	535	69.2	75.7	23.8	90.5	19.8
ANK18	AREA1	612428	6742759	105.14	60718	1.55	2.43	1.13	1.30	125	26700	43300	10.2	14100	39200	885	5190	409	434	92.1	279	31.4	121	24.5
ANK19	AREA1	612428	6742759	106.56	60719	0.17	4.63	0.85	3.78	125	23100	32500	10.8	12700	109000	671	4240	697	469	65.8	39.8	7.2	83.4	14.1
ANK21	AREA1	612428	6742759	109.85	60721	1.60	3.01	1.71	1.30	125	24900	39300	14.2	12700	43100	903	6070	423	479	83.4	326	26.4	94.4	23.1
ANK22	AREA1	612428	6742759	85.76	60722	0.35	2.86	0.60	2.26	125	24700	32600	11.3	13500	64600	288	5570	527	450	75.2	73.2	9.4	75.9	15.0
ANK23	AREA1	612428	6742759	97.8	60723	1.20	1.37	0.88	0.49	125	26800	42000	11.2	13700	13600	771	5870	287	376	63.5	78.9	29.8	85.9	24.0
ANK25	AREA1	612428	6742759	2.27	60725	0.05	8.00	0.36	7.64	125	11900	13600	12.7	5420	225000	309	3910	905	508	25.5	69.4	2.4	31.8	6.58
ANK26	AREA1	612428	6742759	5.56	60726	0.10	2.52	0.52	2.00	125	27400	35300	14.3	15300	57800	307	5710	620	672	50.8	72.0	4.1	78.4	14.7
ANK27	AREA1	612428	6742759	7.51	60727	0.07	1.59	0.30	1.29	125	30100	36300	15.5	15900	35100	324	6380	423	875	75.3	66.4	4.1	80.7	14.6
ANK28	AREA1	612428	6742759	11.44	60728	0.02	1.86	0.38	1.48	125	31900	40600	13.3	16100	44700	294	6100	521	723	57.0	53.3	3.9	90.5	17.3
ANK29	AREA1	612428	6742759	12.56	60729	0.01	1.68	0.28	1.40	125	33000	42900	13.6	16800	40300	301	5520	522	500	70.6	54.9	3.2	94.1	14.5
ANK30	AREA1	612428	6742759	13.61	60730	0.11	1.30	0.27	1.03	125	35900	49100	13.7	19700	29500	327	5630	462	981	58.6	59.3	6.0	109	18.7
ANK31	AREA1	612428	6742759	14.58	60731	0.03	3.65	0.22	3.43	125	31300	43900	17.2	17300	102000	323	4300	1090	1240	86.0	59.8	4.3	95.5	18.2
ANK32	AREA1	612428	6742759	16.23	60732	1.30	1.68	0.61	1.07	125	28800	43600	13.3	15900	35800	295	5770	470	323	46.5	59.8	36.7	106	28.8
ANK33	AREA1	612428	6742759	18.42	60733	0.30	1.94	0.46	1.48	125	29900	38100	14.0	17200	47100	366	5770	582	490	53.9	55.9	8.0	105	19.8
ANK34	AREA1	612428	6742759	21	60734	0.45	1.69	0.42	1.27	125	30100	40000	14.2	17400	38200	377	5600	504	317	74.4	85.4	13.5	97.5	20.6
ANK37	AREA1	612428	6742759	22.55	60737	0.24	1.77	0.34	1.43	125	31700	39300	17.5	17400	43200	332	6210	559	620	57.1	69.7	6.0	101	22.6
ANK38	AREA1	612428	6742759	25.3	60738	0.04	2.07	0.47	1.60	125	32800	38900	15.0	16900	48100	307	6450	530	1200	47.2	48.8	3.0	85.7	14.4
ANK39	AREA1	612428	6742759	25.7	60739	0.60	2.60	0.57	2.03	125	30800	40800	13.8	16400	58900	473	5780	588	720	51.5	53.9	9.8	86.9	26.3
ANK40	AREA1	612428	6742759	27.25	60740	1.49	0.95	0.63	0.31	125	26800	39700	14.0	16600	9660	277	6040	330	274	30.8	61.6	32.7	137	21.5
ANK41	AREA1	612428	6742759	28.3	60741	1.35	0.95	0.61	0.35	125	28800	40600	14.9	19800	9100	294	5590	339	271	42.8	75.8	12.9	146	22.3
ANK42	AREA1	612428	6742759	31.5	60742	1.62	1.36	0.51	0.84	125	29900	41300	17.3	21000	25300	311	6210	588	278	43.7	77.4	12.2	154	23.9
ANK43	AREA1	612428	6742759	33.1	60743	0.99	1.15	0.48	0.67	125	29800	38400	16.9	21800	19900	295	5170	485	311	42.3	72.1	11.2	148	21.3
ANK44	AREA1	612428	6742759	36.3	60744	1.22	1.12	0.38	0.74	125	29100	40400	17.1	20400	20000	291	5740	557	260	41.0	98.4	12.0	134	19.7
ANK45	AREA1	612428	6742759	36.5	60745	0.55	1.22	0.38	0.84	125	30500	40900	16.1	20300	25500	307	5040	524	353	38.6	58.2	9.9	128	22.1
ANK46	AREA1	612428	6742759	38.3	60746	0.75	1.09	0.41	0.68	125	27600	35900	15.9	19000	19600	323	5100	489	313	53.2	80.0	13.7	126	19.7
ANK47	AREA1	612428	6742759	37.46	60747	1.20	1.49	0.51	0.99	125	28000	40600	16.9	19400	28000	305	5450	599	265	51.3	97.3	22.7	143	23.9
ANK48	AREA1	612428	6742759	40.5	60748	1.15	1.26	0.65	0.61	125	27100	39600	14.7	19200	14200	280	5270	496	259	41.1	79.6	22.7	148	25.6
ANK49	AREA1	612428	6742759	41.3	60749	1.85	1.75	1.00	0.74	125	31000	44300	17.2	18900	18500	295	6840	462	238	43.8	152	56.5	174	26.4
ANK50	AREA1	612428	6742759	42.14	60750	1.60	1.33	0.50	0.83	125	27300	41600	16.6	18100	21100	331	5450	500	307	42.8	115	34.6	159	28.2
ANK51	AREA1	612428	6742759	44.45	60751	0.28	1.31	0.38	0.93	125	28300	33800	15.7	18100	26400	323	5680	546	257	53.1	61.8	7.7	116	16.1
ANK53	AREA1	612428	6742759	45.25	60753	0.41	1.64	0.40	1.24	125	32300	39500	16.0	20900	36300	318	5550	646	258	41.8	56.7	7.6	130	19.2
ANK54	AREA1	612428	6742759	45.73	60754	0.72	1.19	0.44	0.75	125	30100	40900	16.2	19700	21500	319	5420	470	267	39.2	54.3	12.3	129	23.9
ANK55	AREA1	612428	6742759	46.26	60755	0.85	1.09	0.38	0.71	125	30300	41300	15.2	19000	17900	323	5880	421	247	46.7	60.2	22.1	128	26.2
ANK56	AREA1	612428	6742759	46.83	60756	0.39	1.18	0.44	0.73	125	31900	37800	14.4	19500	23100	312	6150	463	283	57.0	60.3	7.3	114	16.9
ANK57	AREA1	612428	6742759	47.35	60757	0.51	1.56	0.53	1.03	125	28400	35200	14.2	16700	29200	307	6120	518	286	55.6	78.4	15.5	106	19.5
ANK58	AREA1	612428	6742759	48.66	60758	0.42	1.93	0.40	1.52	125	29900	37000	14.4	17700	42900	311	5940	598	314	54.3	90.9	8.1	101	17.5
ANK59	AREA1	612428	6742759	48.95	60759	0.25	2.27	0.31	1.96	125	34100	39400	20.1	18700	60400	345	6730	684	2970	51.1	55.6	6.7	107	15.3
ANK60	AREA1	612428	6742759	49.21	60760	0.70	1.93	0.57	1.37	125	31800	42100	12.3	18500	33400	320	6090	514	329	44.7	53.6	15.3	115	27.3
ANK61	AREA1	612428	6742759	50.15	60761	0.65	3.24	0.71	2.53	125	24500	34500	13.0	13200	73500	281	4770	778	1140	35.9	40.8	25.1	91.3	19.2
ANK62	AREA1	612428	6742759	50.43	60762	1.64	1.92	1.54	0.38	125	29200	47300	10.6	16100	11400	301	5710	303	449	39.4	105	65.7	138	39.7
ANK65	AREA1	612428	6742759	50.9	60765	0.89	1.85	0.69	1.16	125	27100	39600	12.0	15000	25000	329	5360	402	426	38.1	68.2	26.1	106	30.7
ANK66	AREA1	612428	6742759	51.5	60766	0.21	0.99	0.41	0.58	125	39300	50600	15.0	20900	17100	301	6730	358	903	74.1	86.2	7.3	125	23.5

*ID	*IDGP	E	N	D	NGU	S%ngu	C%ngu	TOC%ngu	(C-TOC)%ngu	Si	Al	Fe	Ti	Mg	Ca	Na	K	Mn	P	Cu	Zn	Pb	Ni	Co
ANK68	AREA1	612428	6742759	55.42	60768	0.08	1.53	0.45	1.08	125	34700	42800	15.2	19000	33100	312	6230	468	1090	77.5	55.5	3.5	94.5	15.9
ANK69	AREA1	612428	6742759	55.84	60769	0.14	1.23	0.32	0.91	125	33500	41400	14.4	22900	25300	311	4810	549	275	61.6	153	6.3	159	20.1
ANK70	AREA1	612428	6742759	57.65	60770	0.06	7.42	0.05	7.41	125	10400	15300	17.4	8350	194000	324	2520	2880	435	7.1	53.5	1	42.2	15.6
ANK71	AREA1	612428	6742759	55.85	60771	0.23	1.30	0.31	0.99	125	32900	45000	17.3	27200	24100	256	5790	814	329	62.7	148	5.4	151	18.8
ANK72	AREA1	612428	6742759	59.22	60772	0.81	1.40	0.45	0.94	125	29200	42100	13.9	20200	26100	259	5170	586	351	36.9	54.9	14.4	143	28.4
ANK73	AREA1	612428	6742759	110.41	60773	2.32	3.31	1.96	1.35	125	28900	46000	16.5	13300	40300	845	7690	418	683	102	364	40.2	124	27.9
ANK74	AREA1	612428	6742759	110.78	60774	0.41	9.64	0.23	9.41	125	7340	10700	15.5	6130	256000	430	2500	1020	946	15.0	57.9	1	26.4	7.02
ANK75	AREA1	612428	6742759	111.1	60775	1.66	2.82	1.86	0.96	125	28700	42400	15.2	13900	29500	934	6960	364	713	88.0	203	38.2	112	28.0
ANK76	AREA1	612428	6742759	111.47	60776	1.84	1.49	0.75	0.74	125	25600	43800	13.7	13100	20600	911	6460	358	450	69.4	89.9	25.4	91.6	26.5
ANK78	AREA1	612428	6742759	113.35	60778	1.37	1.76	0.99	0.77	125	27800	41400	13.1	14100	19100	870	6490	341	733	70.2	75.0	29.4	82.6	23.6
ANK79	AREA1	612428	6742759	114.3	60779	1.33	1.43	1.14	0.29	125	27200	43100	11.9	13700	10400	618	6050	279	430	70.8	104	35.9	90.5	26.3
ANK80	AREA1	612428	6742759	115.35	60780	1.79	1.68	1.21	0.46	125	28200	50000	12.3	14400	16500	709	5540	315	443	113	907	38.6	104	25.5
ANK81	AREA1	612428	6742759	115.89	60781	1.23	1.25	0.81	0.45	125	27200	41400	13.7	14100	11000	803	6290	309	405	59.6	76.0	30.1	79.0	24.4
ANK82	AREA1	612428	6742759	116.45	60782	0.51	1.28	0.64	0.64	125	28700	36500	15.9	13500	18500	816	6590	306	1780	49.3	60.6	13.2	79.2	25.6
ANK83	AREA1	612428	6742759	117.55	60783	0.05	1.02	0.34	0.68	125	28200	33900	12.8	13800	17200	795	6390	341	513	51.6	55.6	5.0	68.1	17.0
ANK84	AREA1	612428	6742759	120.72	60784	0.06	3.01	0.50	2.51	125	28100	37400	14.2	13500	67400	713	5790	477	376	40.0	46.6	4.3	43.1	14.0
ANK88	AREA1	612428	6742759	130	60763	0.43	0.47	0.24	0.23	125	23700	23300	14.0	7400	6390	710	8140	144	1760	44.4	94.4	10.0	32.1	9.99
ANK89	AREA1	612428	6742759	149.99	60777	1.21	4.60	4.17	0.43	125	25600	30600	16.9	7720	16000	581	8490	176	1040	115	178	46.8	107	23.4
SLO1	AREA2	597400	6643101	1	60791	3.15	12.8	10.6	2.20	125	17300	43200	197	3930	63600	306	6960	222	875	118	403	16.5	89.1	21.4
SLO2	AREA2	597400	6643102	2	60792	5.70	13.1	12.1	0.97	125	18500	51500	228	3570	29600	290	7690	272	1190	132	293	52.1	153	28.8
SLO3	AREA2	597400	6643103	3	60793	5.28	11.9	11.0	0.93	125	18600	43100	134	3190	28900	314	7780	256	815	156	123	35.7	144	29.3
SLO4	AREA2	597400	6643104	4	60794	5.47	11.6	11.2	0.36	125	17400	49200	117	2700	9110	295	7280	208	908	160	124	29.8	114	29.9
SLO5	AREA2	597400	6643105	5	60795	7.96	11.2	10.9	0.35	125	17900	62700	121	2830	12500	310	7420	178	1080	157	171	33.7	220	33.3
SLO6	AREA2	597400	6643106	6	60796	5.47	11.4	10.8	0.61	125	16700	44000	114	3560	22200	300	7060	255	1180	156	110	28.2	133	31.7
SLO7	AREA2	597400	6643107	7	60797	2.38	14.2	7.78	6.46	125	11900	19800	94.3	9000	170000	258	4950	743	1150	62.9	82.5	12.5	58.8	11.7
SLO8	AREA2	597400	6643108	8	60798	5.57	9.66	9.51	0.15	125	18000	58300	101	2390	5220	300	7530	136	736	198	138	33.5	145	32.4
SLO9	AREA2	597400	6643109	9	60799	4.55	12.1	11.3	0.76	365	16500	41600	98.6	3340	21200	304	6940	242	1140	169	109	27.5	118	28.5
SLO10	AREA2	597400	6643110	10	60800	4.25	11.4	11.0	0.43	125	18300	43200	112	3380	13100	302	7530	232	982	167	126	28.2	123	29.0
SLO11	AREA2	597400	6643111	11	60801	6.02	10.9	10.2	0.66	125	16800	48100	87.2	3580	18500	308	7090	220	817	170	121	30.4	134	29.8
SLO13	AREA2	597400	6643113	13	60803	6.83	11.7	9.80	1.89	125	13100	52800	80.2	4410	54600	304	5530	310	952	123	99.5	24.1	104	24.7
SLO14	AREA2	597400	6643114	14	60804	5.28	12.4	9.90	2.53	125	17200	40500	107	4690	71900	283	7120	382	1120	120	98.0	23.2	108	23.1
SLO15	AREA2	597400	6643115	15	60805	6.67	9.74	9.21	0.54	125	18700	53600	105	2830	14300	300	7660	170	910	189	200	34.3	200	33.4
SLO16	AREA2	597400	6643116	16	60806	5.46	10.7	7.81	2.92	125	16300	42600	87.4	7660	76000	285	6730	387	757	132	117	23.3	95.3	22.3
SLO17	AREA2	597400	6643117	17	60807	4.83	10.5	10.3	0.16	125	18900	48500	103	2440	5800	297	7780	134	930	167	254	33.8	228	30.6
SLO18	AREA2	597400	6643118	18	60808	5.21	11.2	8.08	3.07	125	13400	41800	77.2	5870	82500	272	5630	437	713	124	102	23.0	138	24.8
SLO19	AREA2	597400	6643119	19	60809	5.77	13.0	12.1	0.91	125	19800	45600	138	3340	18000	328	8020	182	1620	175	120	37.4	185	32.0
SLO20	AREA2	597400	6643120	20	60810	0.37	14.9	4.03	10.85	125	3800	6860	42.5	4870	292000	213	1660	694	564	20.9	17.9	1	18.5	3.12
SLO21	AREA2	597400	6643121	21	60811	5.72	12.5	11.6	0.90	125	16800	47500	117	2860	27800	294	6860	268	1110	128	143	30.0	160	33.0
SLO22	AREA2	597400	6643122	22	60812	5.35	13.7	12.4	1.22	125	14600	43600	95.7	2760	29300	303	6090	217	1000	146	112	29.5	133	29.1
SLO23	AREA2	597400	6643123	23	60813	5.71	13.7	12.4	1.28	125	14000	44100	85.3	2440	24700	283	5930	197	1150	159	124	31.4	148	29.7
SLO24	AREA2	597400	6643124	24	60814	6.90	13.0	11.9	1.08	125	13100	62900	87.8	2260	24500	288	5470	204	1120	158	112	30.1	133	26.9
SLO25	AREA2	597400	6643125	25	60815	6.28	12.2	11.7	0.51	125	14500	50800	95.5	2410	10100	283	6070	227	1500	159	115	29.1	117	29.3

*ID	V	Mo	Cd	Cr	Ba	Sr	Zr	B	Be	Li	Sc	Ce	La	Y	As	Lok	SiO2%	Al2O3%	Fe2O3%	MnO%	MgO%	CaO%	Na2O%	K2O%
ANK1	66.2	0.5	0.05	121	153	81.5	16.9	16	1.02	72.5	11.0	10.4	6.52	8.50	1	HANKER1	55.78	16.92	7.14	0.07	4.24	2.16	1.09	3.61
ANK2	65.1	0.5	0.05	114	115	51.3	16.1	16	1.02	72.3	9.93	9.9	6.39	6.68	1	HANKER2	57.26	17.46	7.22	0.05	4.3	1.32	1.06	3.75
ANK3	63.8	0.5	0.05	107	188	117	16.3	16	0.99	71.0	9.91	10.2	6.35	8.84	1	HANKER3	54.52	16.87	7.04	0.08	4.11	3.34	0.96	3.63
ANK4	68.2	0.5	0.05	99.8	162	131	15.4	18	1.06	74.3	10.3	10.8	6.49	9.48	1	HANKER4	53.73	17.32	7.12	0.07	4.1	3.57	0.92	3.77
ANK5	55.1	0.5	0.05	74.1	178	192	14.1	18	1.12	73.8	10.0	10.7	6.27	10.4	1	HANKER5	50.77	17.62	7.42	0.08	4.09	4.78	0.76	3.97
ANK6	63.3	0.5	0.05	76.6	731	175	15.7	17	1.05	73.5	10.5	10.9	6.59	9.83	1	HANKER6	51.72	17.59	7.69	0.07	3.85	4.17	0.85	3.9
ANK7	68.4	0.5	0.05	75.2	89.4	222	15.2	14	0.96	107	9.81	13.2	8.06	11.5	1	HANKER7	43.41	19.91	10.56	0.07	4.69	5.23	0.61	4.05
ANK8	57.0	0.5	0.05	64.8	129	291	12.2	15	0.92	74.5	9.18	13.0	6.99	12.0	1	HANKER8	46.93	16.96	7.84	0.09	3.52	7.94	0.79	3.64
ANK9	54.0	0.5	0.05	58.8	246	165	14.8	16	1.15	66.4	9.15	11.7	6.27	11.8	1	HANKER9	51.26	18.3	7.11	0.06	3.47	4.44	0.68	4.29
ANK10	52.4	0.5	0.05	64.5	133	180	14.8	17	1.14	71.8	10.8	13.6	6.84	14.1	1	HANKER10	49.85	18.49	7.62	0.06	3.6	4.42	0.77	4.18
ANK11	44.3	0.5	0.05	58.3	194	204	15.0	17	0.99	67.1	10.0	12.3	7.19	11.6	1	HANKER11	48.51	18.66	7.79	0.06	3.51	5.17	0.7	4.28
ANK12	39.7	0.5	0.10	48.0	227	389	12.0	20	0.91	48.4	10.9	14.0	7.18	16.6	1	HANKER12	41.08	14.19	5.68	0.07	2.55	14.24	0.69	3.24
ANK13	46.5	0.5	0.05	55.1	297	275	15.2	24	1.12	52.5	11.3	11.1	6.30	13.2	2.5	HANKER13	47.92	17.68	7.09	0.06	2.91	6.24	0.86	4.11
ANK15	41.8	0.5	0.05	50.2	159	164	14.2	20	0.96	54.1	10.8	12.6	6.53	14.6	4.0	HANKER15	52.08	17.57	6.97	0.05	2.96	4.24	1.02	4
ANK16	46.5	0.5	0.05	55.6	205	101	16.7	21	1.11	66.7	11.0	15.4	7.41	17.4	6.1	HANKER16	52.82	19.26	7.99	0.04	3.2	2.11	0.99	4.32
ANK17	38.0	0.5	0.05	47.7	206	211	13.4	20	1.15	47.6	9.84	12.5	7.07	13.3	1	HANKER17	50.11	18.01	6.09	0.05	2.65	5.7	0.72	4.4
ANK18	51.8	3.1	0.38	57.2	179	221	15.5	17	1.05	65.2	9.79	11.6	7.32	12.6	6.9	HANKER18	48.09	18.08	7.88	0.06	3.13	5.6	0.7	4.1
ANK19	39.3	0.5	0.05	45.7	161	455	10.6	14	0.65	58.2	8.90	10.9	5.92	18.4	1	HANKER19	38.72	13.31	5.97	0.11	2.69	16.49	0.59	2.79
ANK21	47.9	1.8	0.48	49.8	179	262	14.4	21	1.11	53.0	11.9	11.5	6.84	13.3	7.8	HANKER21	47.57	17.66	7.24	0.06	2.94	6.2	0.96	4.05
ANK22	41.3	0.5	0.05	52.3	229	298	12.8	17	0.95	54.4	9.54	11.8	6.63	12.6	1	HANKER22	46.26	16.39	6.23	0.08	3.05	9.58	0.72	3.77
ANK23	44.2	0.5	0.05	53.5	306	110	13.8	20	1.09	61.9	10.6	9.0	6.55	8.35	8.3	HANKER23	52.38	19.73	7.81	0.04	3.15	1.98	0.98	4.53
ANK25	22.6	0.5	0.14	21.7	62.9	299	6.3	14	0.49	19.6	8.86	13.5	6.24	16.3	1	HANKER25	22.46	6.27	2.56	0.15	1.21	35.13	0.36	1.36
ANK26	54.4	0.5	0.05	58.2	190	210	12.5	18	1.02	61.4	11.1	11.5	6.26	15.4	1	HANKER26	48.31	15.68	6.75	0.1	3.33	8.64	0.7	3.5
ANK27	57.1	0.5	0.05	64.7	183	159	13.6	21	1.12	67.1	11.1	12.6	6.67	13.8	1	HANKER27	52	17.47	7.06	0.06	3.48	5.24	0.87	3.88
ANK28	58.8	0.5	0.05	64.9	374	212	12.1	17	1.12	72.2	10.7	12.5	6.98	11.5	1	HANKER28	47.95	17.8	7.8	0.08	3.54	6.56	0.71	3.97
ANK29	65.4	0.5	0.05	74.7	143	196	11.1	15	1.06	77.9	10.5	12.0	7.14	9.26	1	HANKER29	48.69	17.96	8.28	0.08	3.69	6.06	0.8	3.81
ANK30	67.9	0.5	0.05	76.2	206	141	13.5	15	1.18	87.4	10.7	12.4	7.28	10.5	1	HANKER30	47.22	19.64	9.35	0.07	4.2	4.38	0.75	4.23
ANK31	59.3	0.5	0.05	67.0	82.4	292	9.8	13	0.78	77.1	10.3	13.6	6.91	16.0	1	HANKER31	38.45	13.82	8.03	0.17	3.47	15.28	0.62	2.64
ANK32	50.1	0.5	0.05	66.2	91.7	213	13.6	17	1.02	66.1	10.1	10.4	6.57	10.1	6.7	HANKER32	50.26	17.39	8.02	0.07	3.54	5.16	0.78	3.97
ANK33	57.4	0.5	0.05	72.1	88.2	260	12.5	16	0.99	69.7	10.1	10.7	5.95	11.0	1	HANKER33	48.73	16.88	7.28	0.09	3.74	6.99	0.79	3.75
ANK34	56.8	0.5	0.05	69.9	88.3	226	12.7	16	1.01	70.3	10.2	10.5	6.50	10.5	1	HANKER34	51.16	16.9	7.41	0.08	3.72	5.52	0.81	3.76
ANK37	63.0	0.5	0.05	77.3	141	237	12.2	21	1.02	72.1	10.7	10.9	6.60	12.1	1	HANKER37	50.92	16.3	7.51	0.09	3.66	6.5	0.8	3.47
ANK38	62.9	0.5	0.05	68.4	134	259	13.3	17	1.11	72.8	10.2	12.0	6.20	14.2	1	HANKER38	47.66	17.69	7.56	0.08	3.7	7.23	0.76	3.9
ANK39	51.5	0.5	0.05	59.0	120	253	12.6	16	1.05	69.6	9.53	9.4	5.82	13.1	3.5	HANKER39	45.44	16.91	7.7	0.09	3.58	8.84	0.71	3.77
ANK40	53.1	0.5	0.05	68.5	113	49.2	19.4	16	1.10	60.3	7.91	8.4	5.92	6.86	3.6	HANKER40	56.54	17.45	7.36	0.04	3.74	1.46	0.89	4.18
ANK41	53.1	0.5	0.05	83.2	202	48.3	19.3	14	1.13	69.8	7.28	9.5	6.40	7.01	1	HANKER41	55.86	17.64	7.52	0.05	4.24	1.35	0.82	4.08
ANK42	56.9	0.5	0.05	89.1	141	126	18.4	15	1.08	69.5	8.29	10.1	6.39	10.4	1	HANKER42	53.5	16.36	7.55	0.09	4.3	3.7	0.95	3.64
ANK43	59.8	0.5	0.05	110	86.3	104	17.4	14	1.00	73.4	8.83	10.6	6.25	10.5	1	HANKER43	55.87	16.6	7.1	0.07	4.46	2.94	1.06	3.53
ANK44	57.7	0.5	0.05	88.2	134	106	18.7	16	1.13	68.6	9.08	10.1	6.28	10.6	1	HANKER44	54.49	16.8	7.39	0.08	4.28	2.92	1	3.74
ANK45	56.9	0.5	0.05	91.2	119	145	14.9	15	1.02	74.9	9.79	10.0	6.08	10.5	1	HANKER45	53.35	16.76	7.63	0.08	4.2	3.79	0.95	3.6
ANK46	57.9	0.5	0.05	107	70.1	109	17.1	14	0.97	66.4	9.69	10.2	6.08	10.8	1	HANKER46	57.39	16.18	6.77	0.07	4.01	2.94	1.17	3.49
ANK47	56.9	0.5	0.05	89.6	201	162	18.5	14	1.02	67.8	9.04	10.3	6.51	11.7	1	HANKER47	53.02	16.19	7.53	0.09	4.01	4.13	0.96	3.63
ANK48	57.0	0.5	0.05	83.4	119	58.2	20.6	14	1.06	65.3	8.29	9.7	6.40	8.89	1	HANKER48	56.33	16.79	7.33	0.07	4.02	2.11	1	3.83
ANK49	72.6	5.7	0.16	76.4	443	111	23.8	18	1.05	68.6	7.64	10.9	7.35	8.93	8.7	HANKER49	54.12	16.72	7.95	0.06	3.9	2.69	0.81	3.87
ANK50	57.0	0.5	0.05	93.9	90.2	136	18.7	15	1.01	64.4	8.83	10.1	6.47	9.63	3.2	HANKER50	55.04	16.21	7.71	0.07	3.84	3.11	0.97	3.65
ANK51	61.1	0.5	0.05	104	183	137	15.5	15	1.04	65.5	10.4	9.6	5.69	9.90	1	HANKER51	55.14	16.24	6.46	0.08	3.86	3.95	1.08	3.57
ANK53	67.5	0.5	0.05	102	118	196	14.5	16	1.01	77.6	10.2	8.4	5.69	9.91	1	HANKER53	50.92	16.53	7.46	0.1	4.34	5.46	0.93	3.48
ANK54	56.8	0.5	0.05	91.3	78.6	121	15.6	16	1.06	73.0	10.0	9.4	6.06	9.52	1	HANKER54	54.15	16.96	7.7	0.07	4.12	3.22	0.99	3.71
ANK55	59.2	0.5	0.05	97.0	86.2	111	15.3	18	1.10	71.4	10.5	9.2	6.35	9.24	1	HANKER55	54.1	17.43	7.82	0.06	4.08	2.69	0.96	3.89
ANK56	59.0	0.5	0.05	80.7	141	142	15.8	17	1.13	73.9	10.0	10.1	6.26	10.2	1	HANKER56	52.98	17.73	7.14	0.07	4.13	3.41	0.85	4.07
ANK57	50.3	0.5	0.05	67.5	319	158	16.2	17	1.10	62.9	9.14	10.0	6.10	9.34	1	HANKER57	53.34	17.31	6.7	0.08	3.69	4.3	0.86	4.06
ANK58	57.5	0.5	0.05	71.4	106	255	13.1	17	1.07	69.2	9.88	9.4	5.74	11.4	1	HANKER58	50.04	16.6	7.13	0.09	3.79	6.44	0.81	3.74
ANK59	65.0	0.5	0.05	75.8	172	320	14.8	19	1.00	73.8	10.5	20.2	7.13	24.7	1	HANKER59	47.38	15.72	7.32	0.11	3.86	8.98	0.74	3.4
ANK60	58.7	0.5	0.05	74.2	90.7	192	13.8	17	1.11	75.3	10.3	8.5	5.90	8.96	1	HANKER60	48.38	18.17	8.09	0.07	4.04	5.05	0.7	4.17
ANK61	48.3	0.5	0.05	51.9	149	306	13.5	14	0.76	55.3	7.44	11.9	5.84	14.2	4.2	HANKER61	47.23	13.69	6.41	0.12	2.91	11.24	0.54	3.15
ANK62	69.3	4.8	0.05	61.4	123	69.7	18.0	16	1.10	67.7	8.66	9.5	6.81	7.24	9.7	HANKER62	51.57	18.72	8.93	0.04	3.69	1.73	0.68	4.45
ANK65	51.4	0.5	0.05	66.5	290	149	14.8	14	1.02	62.4	9.48	10.0	6.33	9.46	3.0	HANKER65	53.26	17.22	7.64	0.06	3.41	3.83	0.9	3.96
ANK66	77.3	0.5	0.05	91.1	172	110	15.1	18	1.17	89.8	10.9	11.1	7.05	11.0	1	HANKER66	49.29	19.92	9.5	0.05	4.36	2.55	0.8	4.33

*ID	V	Mo	Cd	Cr	Ba	Sr	Zr	B	Be	Li	Sc	Ce	La	Y	As	Lok	SiO2%	Al2O3%	Fe2O3%	MnO%	MgO%	CaO%	Na2O%	K2O%
ANK68	67.9	0.5	0.05	72.1	169	165	14.5	18	1.27	80.7	11.4	10.8	6.49	11.5	1	HANKER68	48.58	18.21	8.27	0.07	4.03	5.05	0.75	4.01
ANK69	72.4	0.5	0.05	109	172	120	14.0	13	0.92	83.3	9.78	8.5	5.97	9.28	1	HANKER69	53.58	16.74	7.81	0.08	4.57	3.88	0.92	3.37
ANK70	26.3	0.5	0.05	30.9	178	336	5.6	0.50	0.36	20.9	5.18	13.6	5.39	17.0	1	HANKER70	31.73	4.74	2.73	0.51	1.65	30.33	0.5	0.86
ANK71	82.4	0.5	0.05	122	116	88.7	17.3	23	1.39	76.6	13.0	10.5	6.36	9.10	1	HANKER71	53.15	17.32	7.7	0.1	4.91	3.21	0.91	3.69
ANK72	58.9	0.5	0.05	101	90.4	133	17.8	20	1.07	67.1	10.4	10.0	6.54	10.2	1	HANKER72	53.71	16.54	7.29	0.08	4.07	3.58	0.97	3.66
ANK73	64.0	4.0	0.59	57.8	220	225	19.0	29	1.13	54.4	13.3	11.2	7.70	13.9	14.7	HANKER73	48.01	16.8	8.21	0.06	2.86	5.84	0.99	3.77
ANK74	17.3	0.5	0.05	14.2	133	319	4.5	13	0.31	11.4	5.87	10.9	3.91	15.8	2.7	HANKER74	18.42	3.71	1.88	0.17	1.21	39.39	0.37	0.67
ANK75	59.9	2.4	0.29	57.4	249	189	17.2	24	1.19	60.1	13.2	10.4	7.17	12.9	10.2	HANKER75	48.35	18.24	7.98	0.05	3.13	4.42	1.01	4.14
ANK76	42.1	0.5	0.11	47.7	235	140	15.1	22	1.18	51.6	11.7	9.8	7.11	9.80	10.8	HANKER76	51.45	18.41	8.06	0.05	3.04	3.09	1.02	4.35
ANK78	44.9	0.5	0.05	53.8	255	134	14.6	23	1.13	58.9	12.1	11.4	6.95	12.3	5.6	HANKER78	51.38	18.82	7.77	0.05	3.19	2.86	1.02	4.32
ANK79	45.3	0.5	0.11	56.2	186	88.4	14.0	21	1.10	59.9	11.7	11.6	7.60	9.03	8.6	HANKER79	53.45	19.08	8.05	0.04	3.11	1.56	1.03	4.41
ANK80	46.2	0.5	2.74	55.2	221	119	14.8	19	0.98	67.1	10.0	10.8	7.87	10.2	11.7	HANKER80	50.61	18.84	9.15	0.04	3.2	2.41	0.99	4.22
ANK81	43.1	0.5	0.05	53.0	202	93.4	13.9	22	1.18	58.6	11.6	10.5	7.17	8.71	7.7	HANKER81	54.24	19.03	7.75	0.04	3.19	1.61	1.06	4.4
ANK82	48.4	0.5	0.05	57.0	189	121	15.9	22	1.12	59.4	11.5	16.8	7.82	16.7	3.4	HANKER82	54.33	18.37	6.92	0.04	3.03	2.76	1.14	4.14
ANK83	56.6	0.5	0.05	54.5	194	122	13.6	21	1.23	61.7	13.1	13.8	7.83	11.3	1	HANKER83	55.46	18.72	6.68	0.05	3.12	2.63	1.19	4.2
ANK84	54.6	0.5	0.05	36.8	165	230	11.6	19	1.25	66.6	11.7	14.7	8.66	12.9	1	HANKER84	45.38	15.75	7.12	0.07	2.89	10.23	1	3.31
ANK88	35.6	0.5	0.21	23.2	268	87.3	30.9	25	2.21	38.9	5.86	23.9	10.0	26.9	1	HANKER88	57.86	20.33	5	0.02	2.23	0.94	0.74	5.55
ANK89	189	35.4	0.72	24.6	233	92.9	52.0	29	1.83	44.1	5.63	15.2	8.49	21.2	16.9	HANKER89	54.83	17.61	5.69	0.02	2.05	2.3	0.44	4.73
SLO1	221	102	6.83	19.4	243	180	57.6	11	1.99	12.4	6.17	68.5	36.8	30.0	15.4	ØS1	40.65	12.79	7.38	0.03	1.08	9.31	0.47	3.74
SLO2	286	124	5.49	22.4	218	236	60.7	11	2.15	13.8	5.10	73.0	39.3	36.9	67.0	ØS2	45.09	13.22	8.8	0.03	1.04	4.36	0.47	3.98
SLO3	263	114	1.99	21.2	179	144	52.3	17	3.09	13.3	5.64	63.6	34.6	27.8	85.1	ØS3	46.6	13.62	7.48	0.03	1.05	4.25	0.51	4.23
SLO4	224	132	2.10	20.0	142	85.1	51.5	18	2.55	11.1	5.54	71.5	38.8	30.2	74.8	ØS4	49.5	14.07	8.56	0.03	0.99	1.33	0.53	4.43
SLO5	324	128	3.68	22.6	205	123	54.8	19	2.68	10.6	4.78	69.9	38.0	34.4	115	ØS5	44.03	12.76	10.86	0.02	0.95	1.83	0.49	4.13
SLO6	206	129	1.88	20.0	185	169	49.2	18	2.47	10.8	6.74	70.6	37.2	38.7	73.2	ØS6	47.97	13.55	7.66	0.03	1.13	3.27	0.51	4.36
SLO7	176	51.0	1.09	11.7	262	688	27.6	16	1.43	8.41	7.41	47.8	24.1	41.1	30.9	ØS7	25.03	6.8	3.39	0.12	1.85	25.86	0.24	1.96
SLO8	202	124	3.77	23.2	166	63.7	61.6	20	2.64	10.7	4.32	56.3	32.0	26.6	93.7	ØS8	48.18	14.56	9.83	0.01	0.98	0.72	0.53	4.51
SLO9	196	142	1.62	18.4	197	162	50.7	19	2.48	11.3	6.05	66.8	35.1	36.2	63.2	ØS9	48.01	13.65	7.04	0.03	1.13	3.06	0.48	4.21
SLO10	219	142	1.64	20.4	178	122	51.1	21	2.51	11.8	6.12	68.7	35.9	36.8	61.8	ØS10	49.46	14.1	7.36	0.03	1.11	1.9	0.53	4.43
SLO11	167	135	2.14	19.9	222	260	57.8	19	2.57	11.8	6.02	53.1	29.5	32.1	76.6	ØS11	48.15	14.19	8.32	0.02	1.22	2.74	0.45	4.25
SLO13	155	111	1.90	14.8	242	311	41.0	15	1.89	10.3	5.89	39.9	23.2	30.4	68.7	ØS13	40.46	11.5	9.36	0.04	1.28	8.22	0.42	3.52
SLO14	213	111	1.84	18.1	211	356	41.9	20	1.99	11.5	6.06	46.6	25.4	35.3	63.1	ØS14	39.11	11.28	7.19	0.06	1.27	10.98	0.38	3.42
SLO15	210	152	4.22	22.5	146	94.7	61.7	21	2.60	11.3	7.24	65.9	35.4	34.3	95.3	ØS15	48.17	14.46	9.22	0.02	1.05	2.09	0.51	4.38
SLO16	153	120	1.80	18.0	258	370	46.0	19	2.06	12.0	6.17	42.6	24.1	35.2	64.6	ØS16	38.58	11.49	7.45	0.05	1.81	11.38	0.38	3.44
SLO17	312	153	5.00	22.7	292	62.4	57.8	22	2.79	11.3	5.23	63.3	35.4	32.6	83.9	ØS17	49.47	14.9	8.41	0.02	1.02	0.83	0.51	4.55
SLO18	154	110	2.29	15.0	201	550	43.2	16	1.72	9.45	4.88	38.0	21.3	30.1	68.9	ØS18	38.58	10.98	7.1	0.06	1.49	12.17	0.33	3.26
SLO19	302	134	3.35	23.0	172	132	58.2	24	2.91	13.1	5.61	72.7	35.6	51.7	81.8	ØS19	46.63	13.7	8.04	0.02	1.1	2.71	0.49	4.22
SLO20	75.2	16.2	0.36	3.68	903	1000	6.8	0.50	0.58	3.09	0.99	15.4	7.23	12.6	11.7	ØS20	6.41	1.79	1.18	0.11	0.96	45.89	0.03	0.45
SLO21	242	119	1.96	18.9	179	171	53.4	18	2.33	10.8	5.46	57.1	31.2	36.6	62.7	ØS21	45.53	13.02	8.22	0.04	1.04	4.12	0.42	3.93
SLO22	203	120	1.83	16.3	160	179	51.2	16	2.22	9.25	5.26	56.2	30.0	31.1	61.5	ØS22	45.37	13.1	7.38	0.03	1.05	4.24	0.42	4
SLO23	233	123	2.19	16.6	251	164	51.2	16	2.40	10.1	5.30	55.4	29.9	36.9	70.0	ØS23	45.45	13.37	7.71	0.02	1.01	3.72	0.44	4.06
SLO24	216	113	2.15	15.4	132	178	49.7	15	2.23	9.35	5.07	47.2	26.7	36.1	90.3	ØS24	42.72	12.46	10.97	0.02	0.95	3.67	0.39	3.82
SLO25	179	144	1.91	16.5	176	108	52.5	16	2.31	10.6	5.79	65.0	33.3	44.8	67.5	ØS25	48.45	13.64	8.58	0.03	0.99	1.45	0.48	4.3

*ID	TiO2%	P2O5%	BaO%	L.O.I.%	SUM%	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm	Ba ppm	S ppm	TC%uio	TOC%uio	TIC%uio
ANK1	0.79	0.07	0.05	6.22	98.14	213	443	32	168	45	105	146	8	126	24	199	14	10	5	423	3663	0.80	0.34	0.46
ANK2	0.83	0.08	0.05	5.76	99.14	209	433	24	157	59	89	151	12	98	30	207	14	10	4	420	3180	0.69	0.33	0.36
ANK3	0.77	0.06	0.05	6.85	98.28	212	418	25	159	84	118	151	13	162	25	193	14	11	7	491	3356	1.09	0.34	0.75
ANK4	0.78	0.07	0.05	7.16	98.66	224	365	24	155	62	113	157	9	175	25	189	14	10	5	451	1995	1.13	0.37	0.76
ANK5	0.76	0.07	0.05	8.13	98.50	199	265	25	140	58	71	166	12	243	24	169	13	10	7	486	2419	1.47	0.35	1.12
ANK6	0.78	0.08	0.10	7.73	98.53	219	268	24	125	59	82	162	11	220	22	173	13	11	6	935	2359	1.34	0.44	0.90
ANK7	0.83	0.26	0.05	9.39	99.06	231	263	28	153	26	98	170	8	272	25	172	14	11	7	443	501	1.62	0.52	1.09
ANK8	0.71	0.2	0.05	10.48	99.15	206	226	20	117	64	80	159	7	355	26	152	12	9	9	442	454	2.00	0.32	1.68
ANK9	0.78	0.23	0.06	7.72	98.40	219	218	27	105	79	95	173	10	211	26	162	13	9	6	579	1383	1.42	0.44	0.98
ANK10	0.79	0.3	0.05	7.99	98.12	203	218	29	115	51	69	171	15	229	29	165	13	10	10	457	2571	1.51	0.56	0.95
ANK11	0.77	0.16	0.06	8.46	98.13	188	219	28	129	83	104	172	25	254	29	155	13	9	10	536	5576	1.96	0.83	1.13
ANK12	0.58	0.17	0.06	14.34	96.89	165	178	27	117	75	140	147	19	457	34	121	10	8	13	514	5148	4.08	0.93	3.15
ANK13	0.75	0.25	0.07	8.82	96.76	195	223	26	129	94	86	167	30	327	28	139	11	10	11	591	9287	2.60	1.30	1.30
ANK15	0.76	0.24	0.05	6.91	96.85	168	187	27	86	65	78	158	23	207	33	137	11	9	8	475	6802	1.60	0.75	0.85
ANK16	0.87	0.36	0.06	6.49	98.51	168	207	29	99	56	91	166	29	149	37	150	12	10	10	526	7764	1.06	0.72	0.34
ANK17	0.69	0.13	0.06	8.19	96.80	178	202	28	116	74	86	178	27	255	30	132	12	8	8	550	6482	2.11	0.84	1.27
ANK18	0.72	0.1	0.06	7.84	96.36	218	223	34	142	86	254	166	35	257	24	131	11	9	10	509	9449	2.25	1.19	1.06
ANK19	0.58	0.11	0.05	16.5	97.91	163	189	18	117	76	55	130	13	551	40	125	9	8	10	414	3605	4.48	0.78	3.70
ANK21	0.74	0.12	0.05	8.72	96.31	202	196	33	121	84	313	165	32	310	29	131	12	8	12	470	10212	2.94	1.59	1.35
ANK22	0.69	0.11	0.06	11.35	98.29	184	209	21	101	76	86	162	13	365	28	149	12	9	8	531	2996	2.72	0.54	2.19
ANK23	0.85	0.1	0.07	6.6	98.22	181	212	31	102	62	84	177	32	161	25	143	12	9	8	654	8485	1.27	0.87	0.39
ANK25	0.25	0.12	0.02	29.08	98.97	86	86	13	53	42	98	86	11	411	38	76	4	4	8	187	1637	7.91	0.32	7.59
ANK26	0.7	0.17	0.05	11.08	99.01	197	195	22	101	53	88	148	7	272	32	152	12	11	6	447	1006	2.41	0.46	1.96
ANK27	0.8	0.23	0.05	8.44	99.58	201	211	22	100	74	77	160	8	214	27	166	13	13	7	436	676	1.42	0.30	1.11
ANK28	0.77	0.18	0.07	9.78	99.21	211	219	27	113	61	69	168	10	268	25	164	13	11	9	652	453	1.75	0.34	1.41
ANK29	0.79	0.13	0.05	9.43	99.77	231	257	22	120	77	72	161	6	254	22	172	13	11	8	430	135	1.50	0.25	1.25
ANK30	0.85	0.25	0.06	8.27	99.27	238	270	25	133	56	77	176	10	196	23	180	14	10	7	549	875	1.17	0.28	0.88
ANK31	0.59	0.31	0.04	15.53	98.95	185	239	24	123	79	77	123	5	359	32	136	10	7	6	337	664	3.44	0.19	3.25
ANK32	0.73	0.08	0.04	8.21	98.25	187	246	39	131	44	70	160	41	258	24	153	12	8	8	371	7563	1.63	0.53	1.10
ANK33	0.71	0.13	0.04	9.7	98.83	201	262	26	130	57	71	162	13	317	24	155	13	11	8	365	2373	1.87	0.38	1.49
ANK34	0.73	0.08	0.04	8.57	98.78	196	253	28	119	68	93	158	16	272	24	162	14	10	7	357	2845	1.59	0.41	1.18
ANK37	0.72	0.16	0.04	9.18	99.35	203	253	28	126	52	79	149	8	295	27	164	12	9	6	384	1375	1.68	0.59	1.09
ANK38	0.75	0.3	0.05	9.86	99.54	219	226	23	111	53	65	164	9	319	30	158	13	9	7	421	537	1.89	0.41	1.48
ANK39	0.73	0.18	0.05	10.59	98.59	193	209	36	116	51	68	159	17	310	29	155	13	9	10	418	3800	2.39	0.55	1.84
ANK40	0.79	0.07	0.05	5.86	98.43	195	266	28	155	32	71	170	36	89	26	191	16	10	6	413	10599	0.84	0.43	0.41
ANK41	0.79	0.08	0.06	6.23	98.72	191	314	28	167	42	86	170	15	90	26	183	14	10	9	501	9385	0.81	0.58	0.23
ANK42	0.75	0.07	0.05	7.04	98.00	180	329	34	172	44	90	155	13	167	27	192	14	11	6	404	10256	1.29	0.35	0.94
ANK43	0.77	0.08	0.04	6.36	98.88	190	399	28	175	43	80	151	14	149	28	202	14	9	6	367	7421	1.00	0.48	0.52
ANK44	0.79	0.07	0.05	6.79	98.40	191	337	27	151	41	106	159	13	148	29	199	15	12	6	423	6869	0.97	0.33	0.64
ANK45	0.77	0.09	0.05	7.14	98.41	187	337	29	157	39	74	156	15	194	27	184	13	10	8	415	4209	1.17	0.37	0.79
ANK46	0.79	0.09	0.04	6.21	99.15	191	427	27	149	47	90	148	16	155	29	214	14	10	7	337	5218	0.95	0.38	0.57
ANK47	0.74	0.07	0.05	6.94	97.36	186	329	33	157	46	109	156	31	207	30	191	13	11	7	478	8634	1.32	0.47	0.85
ANK48	0.79	0.07	0.05	6.35	98.74	195	355	32	171	43	93	160	26	105	31	203	15	10	9	439	9394	1.11	0.64	0.47
ANK49	0.75	0.07	0.08	7.32	98.34	229	295	34	209	46	150	163	61	151	25	183	14	12	8	704	14918	1.66	1.10	0.56
ANK50	0.75	0.08	0.04	5.95	97.42	187	368	36	181	43	95	155	36	180	27	194	14	11	7	371	11955	1.17	0.55	0.62
ANK51	0.77	0.07	0.05	7.28	98.55	205	414	27	140	53	70	152	14	191	25	204	13	11	6	436	2936	1.19	0.39	0.81
ANK53	0.75	0.06	0.04	8.49	98.56	220	386	30	159	45	73	153	12	252	27	191	15	11	8	391	2768	1.57	0.35	1.22
ANK54	0.78	0.07	0.04	6.93	98.74	186	328	33	155	41	69	159	13	170	25	187	14	10	8	381	5304	1.09	0.39	0.70
ANK55	0.78	0.07	0.04	6.81	98.73	196	338	34	152	45	70	161	24	159	26	172	13	11	7	358	6620	0.96	0.40	0.55
ANK56	0.78	0.08	0.05	7.45	98.74	205	292	25	137	52	74	171	9	189	27	181	14	11	9	437	2160	1.09	0.35	0.74
ANK57	0.77	0.07	0.06	7.73	98.97	191	260	29	132	54	88	171	19	206	25	181	14	10	4	582	4317	1.40	0.45	0.95
ANK58	0.71	0.08	0.04	9.32	98.79	197	251	24	126	56	103	162	13	311	26	162	12	10	5	385	2335	1.74	0.35	1.39
ANK59	0.67	0.75	0.05	10.39	99.37	188	258	25	133	52	69	152	15	373	47	153	12	10	8	426	1772	2.05	0.31	1.74
ANK60	0.76	0.09	0.04	8.83	98.39	207	274	38	142	46	68	175	17	242	21	155	13	11	9	396	4399	1.56	0.49	1.07
ANK61	0.58	0.29	0.05	11.83	98.04	195	216	28	124	40	55	145	35	373	30	140	11	8	10	439	5829	2.99	0.63	2.36
ANK62	0.78	0.12	0.05	8.08	98.84	266	221	48	184	42	70	179	73	114	21	164	14	9	11	448	12372	1.80	1.41	0.39
ANK65	0.74	0.11	0.06	7.24	98.43	193	246	38	135	40	79	163	30	198	23	160	13	9	8	570	6467	1.41	0.63	0.77
ANK66	0.85	0.24	0.06	7.22	99.17	234	289	32	149	69	97	176	9	155	24	176	15	12	6	522	1384	0.87	0.41	0.46

*ID	TiO2%	P2O5%	BaO%	L.O.I.%	SUM%	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm	Ba ppm	S ppm	TC%uio	TOC%uio	TIC%uio
ANK68	0.78	0.28	0.06	8.81	98.90	220	237	28	119	76	69	166	8	218	24	161	14	11	9	505	646	1.41	0.37	1.04
ANK69	0.78	0.07	0.05	7.64	99.49	222	387	30	190	60	157	141	11	167	23	196	13	10	5	469	1214	1.13	0.28	0.85
ANK70	0.22	0.1	0.03	25.36	98.76	74	132	20	63	14	72	58	9	445	37	76	3	3	9	289	1383	6.91	0.09	6.81
ANK71	0.82	0.07	0.05	8.06	99.99	215	372	22	161	65	133	156	7	136	26	198	14	12	7	405	1684	1.13	0.29	0.84
ANK72	0.76	0.08	0.04	7.29	98.07	199	379	38	167	37	64	153	15	177	27	183	13	12	5	387	5947	1.21	0.41	0.80
ANK73	0.72	0.16	0.06	9.22	96.70	210	197	35	142	102	336	149	44	267	27	129	10	9	14	495	13463	3.99	1.72	2.27
ANK74	0.16	0.23	0.03	31.51	97.75	53	43	10	38	25	88	56	3	438	37	54	1	1	11	251	2457	8.94	0.18	8.76
ANK75	0.79	0.18	0.06	10.14	98.49	222	208	39	140	94	212	163	43	243	28	139	11	9	13	544	11230	2.76	1.75	1.01
ANK76	0.8	0.11	0.06	7.14	97.58	174	186	35	99	68	93	165	28	182	25	143	12	10	5	543	10727	1.41	0.71	0.71
ANK78	0.82	0.19	0.06	7.48	97.96	172	205	30	102	71	85	169	35	183	29	144	13	11	8	571	9234	1.58	0.94	0.65
ANK79	0.84	0.11	0.06	6.85	98.59	165	205	33	110	67	106	168	40	135	25	142	13	9	8	496	9801	1.44	1.02	0.42
ANK80	0.85	0.11	0.06	7.35	97.83	176	210	35	120	99	835	164	43	163	25	146	11	9	10	530	12048	1.56	1.08	0.48
ANK81	0.89	0.11	0.06	6.68	99.06	168	214	31	97	58	87	171	32	142	25	153	13	9	10	520	8378	1.09	0.71	0.38
ANK82	0.86	0.43	0.05	6.4	98.47	171	209	34	99	49	69	164	18	167	34	159	13	11	9	487	4059	1.15	0.59	0.57
ANK83	0.9	0.14	0.06	6.42	99.57	213	212	26	89	55	69	167	11	175	30	169	13	10	6	505	511	0.85	0.28	0.58
ANK84	0.75	0.09	0.05	11.23	97.87	191	136	24	61	38	64	146	12	298	32	156	12	9	8	452	1129	2.81	0.42	2.39
ANK88	1.17	0.45	0.08	5.13	99.50	181	98	12	40	39	85	200	16	162	53	222	24	24	21	691	2012	0.30	0.25	0.05
ANK89	0.97	0.26	0.07	9.71	98.68	739	123	31	127	111	183	181	51	145	60	200	22	16	38	610	8512	4.28	3.75	0.53
SLO1	0.67	0.2	0.17	21.46	97.95	685	112	21	89	127	436	175	22	237	56	155	15	14	133	1523	15908	11.35	9.30	2.05
SLO2	0.7	0.27	0.18	21.06	99.20	824	112	29	145	102	246	151	49	264	54	135	16	13	185	1648	21603	11.61	10.66	0.95
SLO3	0.73	0.19	0.17	19.15	98.01	673	108	35	176	157	130	159	43	188	47	154	17	17	136	1563	35431	10.68	9.65	1.03
SLO4	0.74	0.21	0.18	18.89	99.46	617	103	35	144	152	123	149	32	116	46	144	17	15	130	1638	39646	10.40	10.04	0.36
SLO5	0.71	0.24	0.17	20.1	96.29	855	108	42	252	156	169	140	40	147	50	140	17	13	174	1516	53485	10.09	9.69	0.40
SLO6	0.72	0.27	0.20	19.05	98.72	587	96	41	157	156	114	150	37	204	64	145	17	13	132	1758	39095	10.42	9.70	0.72
SLO7	0.36	0.28	0.13	25.9	91.92	546	70	19	94	87	108	101	21	897	90	99	11	10	194	1161	17820	13.16	6.97	6.19
SLO8	0.78	0.16	0.18	17.85	98.29	578	95	40	160	191	137	149	37	90	39	155	18	14	158	1622	48458	8.83	8.64	0.19
SLO9	0.72	0.26	0.20	19.53	98.32	624	97	35	143	163	113	151	37	197	57	150	17	15	141	1762	36741	11.08	10.26	0.82
SLO10	0.75	0.23	0.20	18.74	98.84	618	100	36	152	163	129	153	34	156	59	148	17	13	138	1810	38496	10.53	10.08	0.45
SLO11	0.76	0.19	0.17	19.07	99.53	554	95	38	149	166	121	147	36	294	51	153	17	14	169	1567	41330	9.96	9.26	0.70
SLO13	0.6	0.22	0.19	20.59	96.40	557	90	32	140	134	101	130	35	359	54	128	14	11	123	1680	40636	10.76	8.95	1.82
SLO14	0.6	0.27	0.17	24.07	98.80	622	89	35	144	140	118	135	34	430	65	134	15	11	159	1492	37340	11.66	9.21	2.45
SLO15	0.76	0.21	0.17	18.15	99.19	606	100	44	213	181	189	149	38	124	53	161	18	16	192	1491	47125	8.96	8.57	0.39
SLO16	0.6	0.18	0.16	19.46	94.98	472	83	28	124	150	135	135	35	437	66	142	15	13	165	1391	37047	9.78	7.06	2.72
SLO17	0.79	0.22	0.18	18.08	98.98	894	116	40	250	161	235	153	41	92	48	162	20	15	217	1649	44430	9.71	9.55	0.16
SLO18	0.56	0.17	0.16	20.05	94.91	550	88	37	181	143	118	126	33	636	56	132	14	11	164	1469	36212	10.11	7.25	2.86
SLO19	0.72	0.39	0.18	20.96	99.16	796	105	41	218	176	125	148	44	169	81	148	18	14	264	1614	41453	11.60	10.93	0.67
SLO20	0.1	0.13	0.17	38.97	96.19	230	20	6	40	44	38	49	8	1484	32	43	1	1	46	1529	6314	13.96	3.78	10.18
SLO21	0.7	0.27	0.17	21.16	98.62	791	103	41	190	139	157	142	36	208	60	142	18	14	195	1526	38254	11.47	10.52	0.95
SLO22	0.69	0.23	0.18	21.88	98.57	752	103	39	164	157	119	147	38	217	52	147	17	13	147	1576	36323	12.47	11.32	1.15
SLO23	0.7	0.27	0.19	22.02	98.96	866	122	34	178	163	124	146	38	204	59	148	17	14	188	1674	40033	12.63	11.58	1.05
SLO24	0.67	0.27	0.17	22.9	99.01	824	108	36	167	159	116	129	36	203	53	130	16	12	175	1514	48895	12.12	11.19	0.93
SLO25	0.73	0.35	0.20	20.12	99.32	621	103	36	138	160	115	141	31	138	68	141	16	11	143	1756	42387	11.11	10.78	0.33

*ID	SiO2ICP%	Al2O3ICP%	Fe2O3ICP%	MnOICP%	MgOICP%	CaOICP%	Na2OICP%	K2OICP%	TiO2ICP%	P2O5ICP%	iO2icp/xrf%	2O3icp/xrf	2O3icp/xrf	InOicp/xrf%	IgOicp/xrf%	CaOicp/xrf%	a2Oicp/xrf	K2Oicp/xrf%	iO2icp/xrf%	2O5icp/xrf%
ANK1	0.0	5.8	5.7	0.0	3.6	2.2	0.0	0.6	0.0	0.1	0.0	34.1	79.9	22.3	84.5	99.8	3.4	17.9	0.3	90.0
ANK2	0.0	5.7	5.5	0.0	3.5	1.2	0.0	0.7	0.0	0.1	0.0	32.9	76.8	23.3	81.4	94.2	3.7	17.4	0.3	75.6
ANK3	0.0	5.6	5.4	0.0	3.3	3.2	0.0	0.7	0.0	0.1	0.0	33.5	77.0	21.3	81.1	95.9	4.1	18.0	0.3	91.7
ANK4	0.0	6.1	5.6	0.0	3.3	3.5	0.0	0.7	0.0	0.1	0.0	35.1	78.1	22.7	81.3	98.0	4.2	19.0	0.3	88.7
ANK5	0.0	5.9	5.6	0.0	3.2	4.5	0.0	0.7	0.0	0.1	0.1	33.2	75.1	21.5	79.1	95.1	5.4	18.2	0.3	90.4
ANK6	0.0	5.9	5.8	0.0	3.1	4.0	0.0	0.7	0.0	0.1	0.1	33.6	75.9	21.2	79.2	96.0	4.6	19.0	0.3	90.2
ANK7	0.0	7.6	8.0	0.0	3.9	4.9	0.0	0.6	0.0	0.2	0.1	38.0	75.4	22.2	83.1	94.4	5.2	13.7	0.2	88.1
ANK8	0.0	5.7	5.8	0.0	2.8	7.5	0.0	0.6	0.0	0.2	0.1	33.8	74.6	21.1	78.7	94.6	4.8	16.3	0.3	92.7
ANK9	0.0	5.5	5.3	0.0	2.6	4.3	0.0	0.7	0.0	0.2	0.1	30.1	75.2	21.8	74.5	96.1	5.5	16.6	0.2	87.9
ANK10	0.0	5.8	5.9	0.0	2.8	4.3	0.0	0.7	0.0	0.3	0.1	31.5	77.3	22.3	77.8	97.8	5.0	16.5	0.3	94.0
ANK11	0.0	5.4	5.9	0.0	2.6	4.9	0.0	0.7	0.0	0.1	0.1	28.9	76.3	21.3	75.1	95.0	5.4	15.5	0.2	87.1
ANK12	0.0	4.5	4.5	0.0	1.9	13.8	0.0	0.7	0.0	0.2	0.1	32.0	78.5	23.5	76.1	97.1	5.9	22.3	0.4	98.8
ANK13	0.0	4.9	5.5	0.0	2.1	6.1	0.1	0.8	0.0	0.2	0.1	27.9	77.0	20.5	71.8	97.1	6.9	19.4	0.3	94.4
ANK15	0.0	4.9	5.4	0.0	2.2	4.1	0.1	0.7	0.0	0.2	0.1	28.1	77.9	23.8	74.5	96.7	8.8	18.2	0.3	96.4
ANK16	0.0	5.6	6.1	0.0	2.4	2.0	0.1	0.8	0.0	0.3	0.1	28.8	76.6	22.8	75.1	94.8	11.0	17.9	0.3	91.7
ANK17	0.0	4.5	4.6	0.0	1.8	5.6	0.1	0.8	0.0	0.1	0.1	25.1	76.1	23.9	68.2	97.9	16.3	17.4	0.2	94.3
ANK18	0.0	5.0	6.2	0.0	2.3	5.5	0.1	0.6	0.0	0.1	0.1	27.9	78.6	22.3	74.7	97.9	17.0	15.2	0.2	99.5
ANK19	0.0	4.4	4.6	0.0	2.1	15.3	0.1	0.5	0.0	0.1	0.1	32.8	77.8	20.7	78.3	92.5	15.3	18.3	0.3	97.7
ANK21	0.0	4.7	5.6	0.0	2.1	6.0	0.1	0.7	0.0	0.1	0.1	26.6	77.6	23.0	71.6	97.3	12.7	18.1	0.3	91.5
ANK22	0.0	4.7	4.7	0.0	2.2	9.0	0.0	0.7	0.0	0.1	0.1	28.5	74.8	21.5	73.4	94.4	5.4	17.8	0.3	93.7
ANK23	0.0	5.1	6.0	0.0	2.3	1.9	0.1	0.7	0.0	0.1	0.1	25.7	76.9	23.4	72.1	96.1	10.6	15.6	0.2	86.2
ANK25	0.0	2.2	1.9	0.0	0.9	31.5	0.0	0.5	0.0	0.1	0.1	35.9	76.0	19.7	74.3	89.6	11.6	34.6	0.8	97.0
ANK26	0.0	5.2	5.0	0.0	2.5	8.1	0.0	0.7	0.0	0.2	0.1	33.0	74.8	20.2	76.2	93.6	5.9	19.7	0.3	90.6
ANK27	0.0	5.7	5.2	0.0	2.6	4.9	0.0	0.8	0.0	0.2	0.1	32.6	73.5	23.0	75.8	93.7	5.0	19.8	0.3	87.2
ANK28	0.0	6.0	5.8	0.0	2.7	6.3	0.0	0.7	0.0	0.2	0.1	33.9	74.4	21.3	75.4	95.3	5.6	18.5	0.3	92.0
ANK29	0.0	6.2	6.1	0.0	2.8	5.6	0.0	0.7	0.0	0.1	0.1	34.7	74.1	21.3	75.5	93.0	5.1	17.5	0.3	88.1
ANK30	0.0	6.8	7.0	0.0	3.3	4.1	0.0	0.7	0.0	0.2	0.1	34.5	75.1	21.5	77.8	94.2	5.9	16.0	0.3	89.9
ANK31	0.0	5.9	6.3	0.0	2.9	14.3	0.0	0.5	0.0	0.3	0.1	42.8	78.2	20.9	82.7	93.4	7.0	19.6	0.5	91.7
ANK32	0.0	5.4	6.2	0.0	2.6	5.0	0.0	0.7	0.0	0.1	0.1	31.3	77.7	21.9	74.5	97.1	5.1	17.5	0.3	92.5
ANK33	0.0	5.6	5.4	0.0	2.9	6.6	0.0	0.7	0.0	0.1	0.1	33.5	74.8	21.1	76.3	94.3	6.2	18.5	0.3	86.4
ANK34	0.0	5.7	5.7	0.0	2.9	5.3	0.1	0.7	0.0	0.1	0.1	33.7	77.2	20.6	77.6	96.8	6.3	17.9	0.3	90.8
ANK37	0.0	6.0	5.6	0.0	2.9	6.0	0.0	0.7	0.0	0.1	0.1	36.7	74.8	20.3	78.8	93.0	5.6	21.6	0.4	88.8
ANK38	0.0	6.2	5.6	0.0	2.8	6.7	0.0	0.8	0.0	0.3	0.1	35.0	73.6	21.6	75.7	93.1	5.4	19.9	0.3	91.7
ANK39	0.0	5.8	5.8	0.0	2.7	8.2	0.1	0.7	0.0	0.2	0.1	34.4	75.8	21.3	76.0	93.2	9.0	18.5	0.3	91.7
ANK40	0.0	5.1	5.7	0.0	2.8	1.4	0.0	0.7	0.0	0.1	0.0	29.0	77.1	26.9	73.6	92.6	4.2	17.4	0.3	89.7
ANK41	0.0	5.4	5.8	0.0	3.3	1.3	0.0	0.7	0.0	0.1	0.0	30.8	77.2	22.1	77.4	94.3	4.8	16.5	0.3	77.6
ANK42	0.0	5.6	5.9	0.0	3.5	3.5	0.0	0.7	0.0	0.1	0.0	34.5	78.2	21.3	81.0	95.7	4.4	20.6	0.4	91.0
ANK43	0.0	5.6	5.5	0.0	3.6	2.8	0.0	0.6	0.0	0.1	0.0	33.9	77.3	22.6	81.0	94.7	3.8	17.6	0.4	89.1
ANK44	0.0	5.5	5.8	0.0	3.4	2.8	0.0	0.7	0.0	0.1	0.0	32.7	78.2	22.7	79.0	95.8	3.9	18.5	0.4	85.1
ANK45	0.0	5.8	5.8	0.0	3.4	3.6	0.0	0.6	0.0	0.1	0.1	34.4	76.6	21.4	80.1	94.1	4.4	16.9	0.3	89.9
ANK46	0.0	5.2	5.1	0.0	3.2	2.7	0.0	0.6	0.0	0.1	0.0	32.2	75.8	22.8	78.6	93.3	3.7	17.6	0.3	79.7
ANK47	0.0	5.3	5.8	0.0	3.2	3.9	0.0	0.7	0.0	0.1	0.1	32.7	77.1	21.7	80.2	94.9	4.3	18.1	0.4	86.8
ANK48	0.0	5.1	5.7	0.0	3.2	2.0	0.0	0.6	0.0	0.1	0.0	30.5	77.2	23.1	79.2	94.2	3.8	16.6	0.3	84.8
ANK49	0.0	5.9	6.3	0.0	3.1	2.6	0.0	0.8	0.0	0.1	0.0	35.0	79.7	25.1	80.4	96.2	4.9	21.3	0.4	77.9
ANK50	0.0	5.2	5.9	0.0	3.0	3.0	0.0	0.7	0.0	0.1	0.0	31.8	77.1	23.3	78.2	94.9	4.6	18.0	0.4	87.9
ANK51	0.0	5.3	4.8	0.0	3.0	3.7	0.0	0.7	0.0	0.1	0.0	32.9	74.8	22.3	77.8	93.5	4.0	19.2	0.3	84.1
ANK53	0.0	6.1	5.6	0.0	3.5	5.1	0.0	0.7	0.0	0.1	0.1	36.9	75.7	21.1	79.8	93.0	4.6	19.2	0.4	98.5
ANK54	0.0	5.7	5.8	0.0	3.3	3.0	0.0	0.7	0.0	0.1	0.0	33.5	75.9	21.9	79.3	93.4	4.3	17.6	0.3	87.4
ANK55	0.0	5.7	5.9	0.0	3.2	2.5	0.0	0.7	0.0	0.1	0.0	32.8	75.5	22.9	77.2	93.1	4.5	18.2	0.3	80.9
ANK56	0.0	6.0	5.4	0.0	3.2	3.2	0.0	0.7	0.0	0.1	0.1	34.0	75.7	21.6	78.3	94.8	4.9	18.2	0.3	81.1
ANK57	0.0	5.4	5.0	0.0	2.8	4.1	0.0	0.7	0.0	0.1	0.1	31.0	75.1	21.1	75.0	95.0	4.8	18.2	0.3	93.6
ANK58	0.0	5.6	5.3	0.0	2.9	6.0	0.0	0.7	0.0	0.1	0.1	34.0	74.2	21.7	77.4	93.2	5.2	19.1	0.3	89.9
ANK59	0.0	6.4	5.6	0.0	3.1	8.5	0.0	0.8	0.0	0.7	0.1	41.0	77.0	20.3	80.3	94.1	6.3	23.8	0.5	90.7
ANK60	0.0	6.0	6.0	0.0	3.1	4.7	0.0	0.7	0.0	0.1	0.1	33.1	74.4	24.0	75.9	92.5	6.2	17.6	0.3	83.8
ANK61	0.0	4.6	4.9	0.0	2.2	10.3	0.0	0.6	0.0	0.3	0.1	33.8	76.9	21.2	75.2	91.5	7.0	18.2	0.4	90.1
ANK62	0.0	5.5	6.8	0.0	2.7	1.6	0.0	0.7	0.0	0.1	0.1	29.5	75.7	24.7	72.3	92.2	6.0	15.5	0.2	85.7
ANK65	0.0	5.1	5.7	0.0	2.5	3.5	0.0	0.6	0.0	0.1	0.1	29.7	74.1	21.9	72.9	91.3	4.9	16.3	0.3	88.7
ANK66	0.0	7.4	7.2	0.0	3.5	2.4	0.0	0.8	0.0	0.2	0.1	37.3	76.2	23.4	79.5	93.8	5.1	18.7	0.3	86.2

*ID	SiO2ICP%	Al2O3ICP%	Fe2O3ICP%	MnOICP%	MgOICP%	CaOICP%	Na2OICP%	K2OICP%	TiO2ICP%	P2O5ICP%	iO2icp/xrf%	2O3icp/xrf	2O3icp/xrf	MnOicp/xrf%	gOicp/xrf%	CaOicp/xrf%	a2Oicp/xrf	K2Oicp/xrf%	iO2icp/xrf%	2O5icp/xrf%
ANK68	0.0	6.6	6.1	0.0	3.2	4.6	0.0	0.8	0.0	0.2	0.1	36.0	74.0	21.8	78.2	91.7	5.6	18.7	0.3	89.2
ANK69	0.0	6.3	5.9	0.0	3.8	3.5	0.0	0.6	0.0	0.1	0.0	37.8	75.8	22.4	83.1	91.2	4.6	17.2	0.3	90.0
ANK70	0.0	2.0	2.2	0.1	1.4	27.1	0.0	0.3	0.0	0.1	0.1	41.5	80.1	18.4	83.9	89.5	8.7	35.3	1.3	99.7
ANK71	0.0	6.2	6.4	0.0	4.5	3.4	0.0	0.7	0.0	0.1	0.1	35.9	83.6	26.6	91.9	105.0	3.8	18.9	0.4	107.7
ANK72	0.0	5.5	6.0	0.0	3.3	3.7	0.0	0.6	0.0	0.1	0.0	33.4	82.6	23.9	82.3	102.0	3.6	17.0	0.3	100.5
ANK73	0.0	5.5	6.6	0.0	2.2	5.6	0.1	0.9	0.0	0.2	0.1	32.5	80.1	22.7	77.1	96.6	11.5	24.6	0.4	97.8
ANK74	0.0	1.4	1.5	0.0	1.0	35.8	0.1	0.3	0.0	0.2	0.1	37.4	81.4	19.6	84.0	90.9	15.7	45.0	1.6	94.3
ANK75	0.0	5.4	6.1	0.0	2.3	4.1	0.1	0.8	0.0	0.2	0.1	29.7	76.0	23.8	73.6	93.4	12.5	20.3	0.3	90.8
ANK76	0.0	4.8	6.3	0.0	2.2	2.9	0.1	0.8	0.0	0.1	0.1	26.3	77.7	23.4	71.5	93.3	12.0	17.9	0.3	93.7
ANK78	0.0	5.3	5.9	0.0	2.3	2.7	0.1	0.8	0.0	0.2	0.1	27.9	76.2	22.3	73.3	93.4	11.5	18.1	0.3	88.4
ANK79	0.0	5.1	6.2	0.0	2.3	1.5	0.1	0.7	0.0	0.1	0.1	26.9	76.5	22.8	73.0	93.3	8.1	16.5	0.2	89.6
ANK80	0.0	5.3	7.1	0.0	2.4	2.3	0.1	0.7	0.0	0.1	0.1	28.3	78.1	25.7	74.6	95.8	9.7	15.8	0.2	92.3
ANK81	0.0	5.1	5.9	0.0	2.3	1.5	0.1	0.8	0.0	0.1	0.0	27.0	76.4	25.2	73.3	95.6	10.2	17.2	0.3	84.4
ANK82	0.0	5.4	5.2	0.0	2.2	2.6	0.1	0.8	0.0	0.4	0.0	29.5	75.4	25.0	73.9	93.8	9.6	19.2	0.3	94.9
ANK83	0.0	5.3	4.8	0.0	2.3	2.4	0.1	0.8	0.0	0.1	0.0	28.5	72.6	22.3	73.3	91.5	9.0	18.3	0.2	84.0
ANK84	0.0	5.3	5.3	0.0	2.2	9.4	0.1	0.7	0.0	0.1	0.1	33.7	75.1	22.2	77.5	92.2	9.6	21.1	0.3	95.7
ANK88	0.0	4.5	3.3	0.0	1.2	0.9	0.1	1.0	0.0	0.4	0.0	22.0	66.6	23.5	55.0	95.1	12.9	17.7	0.2	89.6
ANK89	0.0	4.8	4.4	0.0	1.3	2.2	0.1	1.0	0.0	0.2	0.0	27.5	76.9	28.7	62.4	97.3	17.8	21.6	0.3	91.7
SLO1	0.0	3.3	6.2	0.0	0.7	8.9	0.0	0.8	0.0	0.2	0.1	25.6	83.7	24.2	60.3	95.6	8.8	22.4	4.9	100.3
SLO2	0.0	3.5	7.4	0.0	0.6	4.1	0.0	0.9	0.0	0.3	0.1	26.4	83.7	29.6	56.9	95.0	8.3	23.3	5.4	101.0
SLO3	0.0	3.5	6.2	0.0	0.5	4.0	0.0	0.9	0.0	0.2	0.1	25.8	82.4	27.9	50.4	95.1	8.3	22.2	3.1	98.3
SLO4	0.0	3.3	7.0	0.0	0.4	1.3	0.0	0.9	0.0	0.2	0.1	23.4	82.2	22.6	45.2	95.8	7.5	19.8	2.6	99.1
SLO5	0.0	3.4	9.0	0.0	0.5	1.7	0.0	0.9	0.0	0.2	0.1	26.5	82.5	29.1	49.4	95.6	8.5	21.6	2.8	103.1
SLO6	0.0	3.2	6.3	0.0	0.6	3.1	0.0	0.9	0.0	0.3	0.1	23.3	82.1	27.8	52.2	95.0	7.9	19.5	2.6	100.2
SLO7	0.0	2.2	2.8	0.0	1.5	23.8	0.0	0.6	0.0	0.3	0.1	33.1	83.5	20.2	80.7	92.0	14.5	30.4	4.4	94.1
SLO8	0.0	3.4	8.3	0.0	0.4	0.7	0.0	0.9	0.0	0.2	0.1	23.4	84.8	44.4	40.4	101.4	7.6	20.1	2.2	105.4
SLO9	0.1	3.1	5.9	0.0	0.6	3.0	0.0	0.8	0.0	0.3	0.2	22.8	84.5	26.3	49.0	96.9	8.5	19.9	2.3	100.5
SLO10	0.0	3.5	6.2	0.0	0.6	1.8	0.0	0.9	0.0	0.2	0.1	24.5	83.9	25.2	50.5	96.5	7.7	20.5	2.5	97.8
SLO11	0.0	3.2	6.9	0.0	0.6	2.6	0.0	0.9	0.0	0.2	0.1	22.4	82.7	35.9	48.7	94.5	9.2	20.1	1.9	98.5
SLO13	0.0	2.5	7.5	0.0	0.7	7.6	0.0	0.7	0.0	0.2	0.1	21.5	80.6	25.3	57.1	92.9	9.8	18.9	2.2	99.2
SLO14	0.0	3.2	5.8	0.0	0.8	10.1	0.0	0.9	0.0	0.3	0.1	28.8	80.5	20.8	61.2	91.6	10.0	25.1	3.0	95.1
SLO15	0.0	3.5	7.7	0.0	0.5	2.0	0.0	0.9	0.0	0.2	0.1	24.4	83.1	27.8	44.7	95.7	7.9	21.1	2.3	99.3
SLO16	0.0	3.1	6.1	0.0	1.3	10.6	0.0	0.8	0.0	0.2	0.1	26.8	81.8	25.3	70.2	93.4	10.1	23.6	2.4	96.4
SLO17	0.0	3.6	6.9	0.0	0.4	0.8	0.0	0.9	0.0	0.2	0.1	24.0	82.5	21.9	39.7	97.8	7.9	20.6	2.2	96.9
SLO18	0.0	2.5	6.0	0.0	1.0	11.5	0.0	0.7	0.0	0.2	0.1	23.1	84.2	23.8	65.3	94.9	11.1	20.8	2.3	96.1
SLO19	0.0	3.7	6.5	0.0	0.6	2.5	0.0	1.0	0.0	0.4	0.1	27.3	81.1	29.7	50.3	92.9	9.0	22.9	3.2	95.2
SLO20	0.0	0.7	1.0	0.0	0.8	40.9	0.0	0.2	0.0	0.1	0.4	40.1	83.1	20.6	84.1	89.0	95.7	44.4	7.1	99.4
SLO21	0.0	3.2	6.8	0.0	0.5	3.9	0.0	0.8	0.0	0.3	0.1	24.4	82.6	21.9	45.6	94.4	9.4	21.0	2.8	94.2
SLO22	0.0	2.8	6.2	0.0	0.5	4.1	0.0	0.7	0.0	0.2	0.1	21.1	84.5	23.6	43.6	96.7	9.7	18.3	2.3	99.6
SLO23	0.0	2.6	6.3	0.0	0.4	3.5	0.0	0.7	0.0	0.3	0.1	19.8	81.8	32.2	40.1	92.9	8.7	17.6	2.0	97.6
SLO24	0.0	2.5	9.0	0.0	0.4	3.4	0.0	0.7	0.0	0.3	0.1	19.9	82.0	33.3	39.4	93.4	10.0	17.3	2.2	95.1
SLO25	0.0	2.7	7.3	0.0	0.4	1.4	0.0	0.7	0.0	0.3	0.1	20.1	84.6	24.7	40.4	97.5	7.9	17.0	2.2	98.2

APPENDIX 4:

SAMPLES LIST & LABORATORY DATA REPORTS

NGU
Norges geologiske undersøkelse
7491 TRONDHEIM
Tlf.: 73 90 40 00
Telefaks: 73 92 16 20

ICP-AES ANALYSER
GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

NORSK AKKREDITERING TEST 020

Metoden anvendes på analyseløsninger fremstilt ved ekstraksjon med 7 N HNO_3 i autoklav i samsvar med Norsk Standard - NS 4770
Ettersom denne syrekstraksjonen er partiell, og ikke total, representerer de rapporterte analyseverdiene ikke totalinnhold i prøven.

INSTRUMENT: **ICP-AES type Perkin Elmer Optima 4300 Dual View**
METODE: Metodeoppsettet er beskrevet i NGU-SD 2.11: ICP-AES -analyse av ekstrakter
NEDRE BESTEMMELSESGRENSER (LLQ) FOR ANALYSER BASERT PÅ AUTOKLAVEKSTRAKSJON (1 g prøve i 100 ml analysevolum)
(For analyser med fortynningsfaktor som avviker fra 100, blir deteksjonsgrensene automatisk omregnet).

Si* ppm	Al ppm	Fe ppm	Ti ppm	Mg ppm	Ca ppm	Na ppm	K ppm	Mn ppm	P ppm	Cu ppm	Zn ppm	Pb ppm	Ni ppm	Co ppm
250	20	3	1	100	100	200	100	5	10	1	2	2	1	0.1

V ppm	Mo ppm	Cd ppm	Cr ppm	Ba ppm	Sr ppm	Zr ppm	B ppm	Be ppm	Li ppm	Sc ppm	Ce ppm	La ppm	Y ppm	As ppm
1	1	0.1	0.2	1	1	2	10	0.1	0.5	0.1	2	0.1	0.1	2

*) NGU-lab er ikke akkreditert for Si (i ekstrakter). **(1 mg/kg = 1 ppm)**

ANALYSEUSIKKERHET i) Nedre måleområde (LLQ - 5*LLQ):
± 25 % rel.: Al, Fe, Mg, Ca, Na, K, Mn, Cu, Pb, Ni, Cd, Cr, Ba, Sr, Zr, B, Be, Li, Sc, Ce, La, Y ± 37.5 % rel.: Zn
± 50 % rel.: Ti, P, Co, V, Mo, As
ii) Øvre måleområde (> 5*LLQ):
± 10 % rel.: Al, Fe, Mg, Ca, Na, K, Mn, Cu, Pb, Ni, Cd, Cr, Ba, Sr, Zr, B, Be, Li, Sc, Ce, La, Y ± 15 % rel.: Zn
± 20 % rel.: Ti, P, Co, V, Mo, As
Oppgitte usikkerheter har dekningsfaktor 2 (2 standardavvik), noe som tilsvarer et konfidensintervall på 95 %

PRESISJON : **Det analyseres rutinemessig kontrollprøver som føres i kontrolldiagram (X-diagram). Disse kan forevises om ønskelig.**
ANTALL PRØVER: 106
ANMERKNINGER: Ingen

Gjengivelse av analysedata skal skje på en slik måte at meningsinnholdet i rapporten ikke endres.

Ferdig analysert	24-aug-09	Ellen M. Holm
	Dato	OPERATØR

NGU
Norges geologiske undersøkelse
7491 TRONDHEIM
Tlf.: 73 90 40 00
Telefaks: 73 92 16 20

ICP-AES ANALYSER
GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

NORSK AKKREDITERING TEST 020
7491 TRON
Tlf.: 73 90 4
Telefaks: 7

Prøve ID	Si [mg/kg]	Al [mg/kg]	Fe [mg/kg]	Ti [mg/kg]	Mg [mg/kg]	Ca [mg/kg]	Na [mg/kg]	K [mg/kg]	Mn [mg/kg]	P [mg/kg]	Cu [mg/kg]	Zn [mg/kg]	Pb [mg/kg]	Ni [mg/kg]	Co [mg/kg]	V [mg/kg]
60701	<250	30500	39900	14.7	21600	15400	277	5350	478	275	48.2	96.0	7.7	146	23.4	66.2
60702	<250	30400	38800	15.0	21100	8890	292	5410	357	264	63.4	78.5	8.0	134	17.5	65.1
60703	<250	29900	37900	14.7	20100	22900	294	5430	523	240	94.7	104	7.9	136	17.4	63.8
60704	<250	32200	38900	15.5	20100	25000	286	5950	487	271	67.3	99.8	5.1	129	17.0	68.2
60705	<250	31000	39000	15.3	19500	32500	305	6010	528	276	59.4	55.2	10.4	115	17.4	55.1
60706	<250	31300	40800	14.7	18400	28600	293	6150	455	315	56.6	72.0	7.5	99.4	15.9	63.3
60707	<250	40000	55700	12.0	23500	35300	237	4610	476	1000	25.0	82.5	5.1	120	16.7	68.4
60708	<250	30300	40900	12.9	16700	53700	282	4940	581	809	62.9	65.2	3.5	87.8	14.4	57.0
60709	<250	29200	37400	11.5	15600	30500	276	5920	400	882	83.1	90.0	6.0	83.6	16.5	54.0
60710	<250	30800	41200	13.6	16900	30900	287	5730	410	1230	54.9	58.5	10.6	92.0	22.5	52.4
60711	<250	28500	41600	11.0	15900	35100	281	5500	392	608	80.8	90.7	21.3	102	20.7	44.3
60712	<250	24000	31200	14.8	11700	98800	302	6000	503	733	70.2	123	11.4	82.3	18.9	39.7
60713	<250	26100	38200	13.4	12600	43300	442	6610	377	1030	89.0	76.7	25.9	102	24.0	46.5
60714	<250	3240	5410	39.7	5080	299000	201	1450	686	593	19.7	14.6	<2	16.0	2.82	63.5
60715	<250	26100	38000	13.1	13300	29300	666	6040	365	1010	63.1	68.7	21.0	71.2	19.6	41.8
60716	<250	29400	42800	13.6	14500	14300	806	6420	279	1440	60.1	81.5	27.6	83.8	23.0	46.5
60717	<250	23900	32400	10.2	10900	39900	873	6350	366	535	69.2	75.7	23.8	90.5	19.8	38.0
60718	<250	26700	43300	10.2	14100	39200	885	5190	409	434	92.1	279	31.4	121	24.5	51.8
60719	<250	23100	32500	10.8	12700	109000	671	4240	697	469	65.8	39.8	7.2	83.4	14.1	39.3
60720	<250	3040	5360	37.4	5060	304000	<200	1380	691	594	20.4	17.0	<2	16.0	2.79	61.2
60721	<250	24900	39300	14.2	12700	43100	903	6070	423	479	83.4	326	26.4	94.4	23.1	47.9
60722	<250	24700	32600	11.3	13500	64600	288	5570	527	450	75.2	73.2	9.4	75.9	15.0	41.3
60723	<250	26800	42000	11.2	13700	13600	771	5870	287	376	63.5	78.9	29.8	85.9	24.0	44.2
60724	<250	2880	4930	36.1	5030	299000	230	1300	705	560	17.8	15.5	<2	14.7	2.52	59.8
60725	<250	11900	13600	12.7	5420	225000	309	3910	905	508	25.5	69.4	2.4	31.8	6.58	22.6
60726	<250	27400	35300	14.3	15300	57800	307	5710	620	672	50.8	72.0	4.1	78.4	14.7	54.4
60727	<250	30100	36300	15.5	15900	35100	324	6380	423	875	75.3	66.4	4.1	80.7	14.6	57.1
60728	<250	31900	40600	13.3	16100	44700	294	6100	521	723	57.0	53.3	3.9	90.5	17.3	58.8
60729	<250	33000	42900	13.6	16800	40300	301	5520	522	500	70.6	54.9	3.2	94.1	14.5	65.4
60730	<250	35900	49100	13.7	19700	29500	327	5630	462	981	58.6	59.3	6.0	109	18.7	67.9
60731	<250	31300	43900	17.2	17300	102000	323	4300	1090	1240	86.0	59.8	4.3	95.5	18.2	59.3
60732	<250	28800	43600	13.3	15900	35800	295	5770	470	323	46.5	59.8	36.7	106	28.8	50.1
60733	<250	29900	38100	14.0	17200	47100	366	5770	582	490	53.9	55.9	8.0	105	19.8	57.4
60734	<250	30100	40000	14.2	17400	38200	377	5600	504	317	74.4	85.4	13.5	97.5	20.6	56.8
60735	<250	3260	5340	39.4	5100	302000	230	1430	680	584	20.3	14.2	<2	15.5	2.77	63.2
60737	<250	31700	39300	17.5	17400	43200	332	6210	559	620	57.1	69.7	6.0	101	22.6	63.0

ICP-AES ANALYSER
GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

Prøve ID	Mo [mg/kg]	Cd [mg/kg]	Cr [mg/kg]	Ba [mg/kg]	Sr [mg/kg]	Zr [mg/kg]	B [mg/kg]	Be [mg/kg]	Li [mg/kg]	Sc [mg/kg]	Ce [mg/kg]	La [mg/kg]	Y [mg/kg]	As [mg/kg]
60701	<1	<0.1	121	153	81.5	16.9	16	1.02	72.5	11.0	10.4	6.52	8.50	<2
60702	<1	<0.1	114	115	51.3	16.1	16	1.02	72.3	9.93	9.9	6.39	6.68	<2
60703	<1	<0.1	107	188	117	16.3	16	0.99	71.0	9.91	10.2	6.35	8.84	<2
60704	<1	<0.1	99.8	162	131	15.4	18	1.06	74.3	10.3	10.8	6.49	9.48	<2
60705	<1	<0.1	74.1	178	192	14.1	18	1.12	73.8	10.0	10.7	6.27	10.4	<2
60706	<1	<0.1	76.6	731	175	15.7	17	1.05	73.5	10.5	10.9	6.59	9.83	<2
60707	<1	<0.1	75.2	89.4	222	15.2	14	0.96	107	9.81	13.2	8.06	11.5	<2
60708	<1	<0.1	64.8	129	291	12.2	15	0.92	74.5	9.18	13.0	6.99	12.0	<2
60709	<1	<0.1	58.8	246	165	14.8	16	1.15	66.4	9.15	11.7	6.27	11.8	<2
60710	<1	<0.1	64.5	133	180	14.8	17	1.14	71.8	10.8	13.6	6.84	14.1	<2
60711	<1	<0.1	58.3	194	204	15.0	17	0.99	67.1	10.0	12.3	7.19	11.6	<2
60712	<1	0.10	48.0	227	389	12.0	20	0.91	48.4	10.9	14.0	7.18	16.6	<2
60713	<1	<0.1	55.1	297	275	15.2	24	1.12	52.5	11.3	11.1	6.30	13.2	2.5
60714	14.5	0.32	3.22	967	984	6.5	<10	0.55	2.97	1.18	16.4	7.75	14.1	10.0
60715	<1	<0.1	50.2	159	164	14.2	20	0.96	54.1	10.8	12.6	6.53	14.6	4.0
60716	<1	<0.1	55.6	205	101	16.7	21	1.11	66.7	11.0	15.4	7.41	17.4	6.1
60717	<1	<0.1	47.7	206	211	13.4	20	1.15	47.6	9.84	12.5	7.07	13.3	<2
60718	3.1	0.38	57.2	179	221	15.5	17	1.05	65.2	9.79	11.6	7.32	12.6	6.9
60719	<1	<0.1	45.7	161	455	10.6	14	0.65	58.2	8.90	10.9	5.92	18.4	<2
60720	14.5	0.32	3.07	969	1010	6.3	<10	0.55	2.79	1.16	15.7	7.64	14.0	8.7
60721	1.8	0.48	49.8	179	262	14.4	21	1.11	53.0	11.9	11.5	6.84	13.3	7.8
60722	<1	<0.1	52.3	229	298	12.8	17	0.95	54.4	9.54	11.8	6.63	12.6	<2
60723	<1	<0.1	53.5	306	110	13.8	20	1.09	61.9	10.6	9.0	6.55	8.35	8.3
60724	13.5	0.32	2.95	988	997	5.8	<10	0.53	2.76	1.09	15.7	7.33	13.5	9.4
60725	<1	0.14	21.7	62.9	299	6.3	14	0.49	19.6	8.86	13.5	6.24	16.3	<2
60726	<1	<0.1	58.2	190	210	12.5	18	1.02	61.4	11.1	11.5	6.26	15.4	<2
60727	<1	<0.1	64.7	183	159	13.6	21	1.12	67.1	11.1	12.6	6.67	13.8	<2
60728	<1	<0.1	64.9	374	212	12.1	17	1.12	72.2	10.7	12.5	6.98	11.5	<2
60729	<1	<0.1	74.7	143	196	11.1	15	1.06	77.9	10.5	12.0	7.14	9.26	<2
60730	<1	<0.1	76.2	206	141	13.5	15	1.18	87.4	10.7	12.4	7.28	10.5	<2
60731	<1	<0.1	67.0	82.4	292	9.8	13	0.78	77.1	10.3	13.6	6.91	16.0	<2
60732	<1	<0.1	66.2	91.7	213	13.6	17	1.02	66.1	10.1	10.4	6.57	10.1	6.7
60733	<1	<0.1	72.1	88.2	260	12.5	16	0.99	69.7	10.1	10.7	5.95	11.0	<2
60734	<1	<0.1	69.9	88.3	226	12.7	16	1.01	70.3	10.2	10.5	6.50	10.5	<2
60735	14.2	0.29	3.17	968	1000	6.3	<10	0.57	2.98	1.16	15.9	7.63	14.0	8.3
60737	<1	<0.1	77.3	141	237	12.2	21	1.02	72.1	10.7	10.9	6.60	12.1	<2

7491 TRONDHEIM
Tlf.: 73 90 40 00
Telefaks: 73 92 16 20

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GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

7491 TRON
Tlf.: 73 90 4
Telefaks: 7:

Prøve ID	Si [mg/kg]	Al [mg/kg]	Fe [mg/kg]	Ti [mg/kg]	Mg [mg/kg]	Ca [mg/kg]	Na [mg/kg]	K [mg/kg]	Mn [mg/kg]	P [mg/kg]	Cu [mg/kg]	Zn [mg/kg]	Pb [mg/kg]	Ni [mg/kg]	Co [mg/kg]	V [mg/kg]
60738	<250	32800	38900	15.0	16900	48100	307	6450	530	1200	47.2	48.8	3.0	85.7	14.4	62.9
60739	<250	30800	40800	13.8	16400	58900	473	5780	588	720	51.5	53.9	9.8	86.9	26.3	51.5
60740	<250	26800	39700	14.0	16600	9660	277	6040	330	274	30.8	61.6	32.7	137	21.5	53.1
60741	<250	28800	40600	14.9	19800	9100	294	5590	339	271	42.8	75.8	12.9	146	22.3	53.1
60742	<250	29900	41300	17.3	21000	25300	311	6210	588	278	43.7	77.4	12.2	154	23.9	56.9
60743	<250	29800	38400	16.9	21800	19900	295	5170	485	311	42.3	72.1	11.2	148	21.3	59.8
60744	<250	29100	40400	17.1	20400	20000	291	5740	557	260	41.0	98.4	12.0	134	19.7	57.7
60745	<250	30500	40900	16.1	20300	25500	307	5040	524	353	38.6	58.2	9.9	128	22.1	56.9
60746	<250	27600	35900	15.9	19000	19600	323	5100	489	313	53.2	80.0	13.7	126	19.7	57.9
60747	<250	28000	40600	16.9	19400	28000	305	5450	599	265	51.3	97.3	22.7	143	23.9	56.9
60748	<250	27100	39600	14.7	19200	14200	280	5270	496	259	41.1	79.6	22.7	148	25.6	57.0
60749	<250	31000	44300	17.2	18900	18500	295	6840	462	238	43.8	152	56.5	174	26.4	72.6
60750	<250	27300	41600	16.6	18100	21100	331	5450	500	307	42.8	115	34.6	159	28.2	57.0
60751	<250	28300	33800	15.7	18100	26400	323	5680	546	257	53.1	61.8	7.7	116	16.1	61.1
60752	<250	3550	5510	41.5	5060	290000	248	1550	687	587	20.7	18.8	<2	16.6	2.96	67.9
60753	<250	32300	39500	16.0	20900	36300	318	5550	646	258	41.8	56.7	7.6	130	19.2	67.5
60754	<250	30100	40900	16.2	19700	21500	319	5420	470	267	39.2	54.3	12.3	129	23.9	56.8
60755	<250	30300	41300	15.2	19000	17900	323	5880	421	247	46.7	60.2	22.1	128	26.2	59.2
60756	<250	31900	37800	14.4	19500	23100	312	6150	463	283	57.0	60.3	7.3	114	16.9	59.0
60757	<250	28400	35200	14.2	16700	29200	307	6120	518	286	55.6	78.4	15.5	106	19.5	50.3
60758	<250	29900	37000	14.4	17700	42900	311	5940	598	314	54.3	90.9	8.1	101	17.5	57.5
60759	<250	34100	39400	20.1	18700	60400	345	6730	684	2970	51.1	55.6	6.7	107	15.3	65.0
60760	<250	31800	42100	12.3	18500	33400	320	6090	514	329	44.7	53.6	15.3	115	27.3	58.7
60761	<250	24500	34500	13.0	13200	73500	281	4770	778	1140	35.9	40.8	25.1	91.3	19.2	48.3
60762	<250	29200	47300	10.6	16100	11400	301	5710	303	449	39.4	105	65.7	138	39.7	69.3
60763	<250	23700	23300	14.0	7400	6390	710	8140	144	1760	44.4	94.4	10.0	32.1	9.99	35.6
60765	<250	27100	39600	12.0	15000	25000	329	5360	402	426	38.1	68.2	26.1	106	30.7	51.4
60766	<250	39300	50600	15.0	20900	17100	301	6730	358	903	74.1	86.2	7.3	125	23.5	77.3
60768	<250	34700	42800	15.2	19000	33100	312	6230	468	1090	77.5	55.5	3.5	94.5	15.9	67.9
60769	<250	33500	41400	14.4	22900	25300	311	4810	549	275	61.6	153	6.3	159	20.1	72.4
60770	<250	10400	15300	17.4	8350	194000	324	2520	2880	435	7.1	53.5	<2	42.2	15.6	26.3
60771	<250	32900	45000	17.3	27200	24100	256	5790	814	329	62.7	148	5.4	151	18.8	82.4
60772	<250	29200	42100	13.9	20200	26100	259	5170	586	351	36.9	54.9	14.4	143	28.4	58.9
60773	<250	28900	46000	16.5	13300	40300	845	7690	418	683	102	364	40.2	124	27.9	64.0
60774	<250	7340	10700	15.5	6130	256000	430	2500	1020	946	15.0	57.9	<2	26.4	7.02	17.3
60775	<250	28700	42400	15.2	13900	29500	934	6960	364	713	88.0	203	38.2	112	28.0	59.9

ICP-AES *)NGU-lab er ikke akkreditert for Si (geologisk materiale).

ICP-AES ANALYSER
GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

Prøve ID	Mo [mg/kg]	Cd [mg/kg]	Cr [mg/kg]	Ba [mg/kg]	Sr [mg/kg]	Zr [mg/kg]	B [mg/kg]	Be [mg/kg]	Li [mg/kg]	Sc [mg/kg]	Ce [mg/kg]	La [mg/kg]	Y [mg/kg]	As [mg/kg]
60738	<1	<0.1	68.4	134	259	13.3	17	1.11	72.8	10.2	12.0	6.20	14.2	<2
60739	<1	<0.1	59.0	120	253	12.6	16	1.05	69.6	9.53	9.4	5.82	13.1	3.5
60740	<1	<0.1	68.5	113	49.2	19.4	16	1.10	60.3	7.91	8.4	5.92	6.86	3.6
60741	<1	<0.1	83.2	202	48.3	19.3	14	1.13	69.8	7.28	9.5	6.40	7.01	<2
60742	<1	<0.1	89.1	141	126	18.4	15	1.08	69.5	8.29	10.1	6.39	10.4	<2
60743	<1	<0.1	110	86.3	104	17.4	14	1.00	73.4	8.83	10.6	6.25	10.5	<2
60744	<1	<0.1	88.2	134	106	18.7	16	1.13	68.6	9.08	10.1	6.28	10.6	<2
60745	<1	<0.1	91.2	119	145	14.9	15	1.02	74.9	9.79	10.0	6.08	10.5	<2
60746	<1	<0.1	107	70.1	109	17.1	14	0.97	66.4	9.69	10.2	6.08	10.8	<2
60747	<1	<0.1	89.6	201	162	18.5	14	1.02	67.8	9.04	10.3	6.51	11.7	<2
60748	<1	<0.1	83.4	119	58.2	20.6	14	1.06	65.3	8.29	9.7	6.40	8.89	<2
60749	5.7	0.16	76.4	443	111	23.8	18	1.05	68.6	7.64	10.9	7.35	8.93	8.7
60750	<1	<0.1	93.9	90.2	136	18.7	15	1.01	64.4	8.83	10.1	6.47	9.63	3.2
60751	<1	<0.1	104	183	137	15.5	15	1.04	65.5	10.4	9.6	5.69	9.90	<2
60752	15.5	0.39	3.46	952	973	6.6	<10	0.58	3.11	1.24	16.2	7.83	14.1	10.1
60753	<1	<0.1	102	118	196	14.5	16	1.01	77.6	10.2	8.4	5.69	9.91	<2
60754	<1	<0.1	91.3	78.6	121	15.6	16	1.06	73.0	10.0	9.4	6.06	9.52	<2
60755	<1	<0.1	97.0	86.2	111	15.3	18	1.10	71.4	10.5	9.2	6.35	9.24	<2
60756	<1	<0.1	80.7	141	142	15.8	17	1.13	73.9	10.0	10.1	6.26	10.2	<2
60757	<1	<0.1	67.5	319	158	16.2	17	1.10	62.9	9.14	10.0	6.10	9.34	<2
60758	<1	<0.1	71.4	106	255	13.1	17	1.07	69.2	9.88	9.4	5.74	11.4	<2
60759	<1	<0.1	75.8	172	320	14.8	19	1.00	73.8	10.5	20.2	7.13	24.7	<2
60760	<1	<0.1	74.2	90.7	192	13.8	17	1.11	75.3	10.3	8.5	5.90	8.96	<2
60761	<1	<0.1	51.9	149	306	13.5	14	0.76	55.3	7.44	11.9	5.84	14.2	4.2
60762	4.8	<0.1	61.4	123	69.7	18.0	16	1.10	67.7	8.66	9.5	6.81	7.24	9.7
60763	<1	0.21	23.2	268	87.3	30.9	25	2.21	38.9	5.86	23.9	10.0	26.9	<2
60765	<1	<0.1	66.5	290	149	14.8	14	1.02	62.4	9.48	10.0	6.33	9.46	3.0
60766	<1	<0.1	91.1	172	110	15.1	18	1.17	89.8	10.9	11.1	7.05	11.0	<2
60768	<1	<0.1	72.1	169	165	14.5	18	1.27	80.7	11.4	10.8	6.49	11.5	<2
60769	<1	<0.1	109	172	120	14.0	13	0.92	83.3	9.78	8.5	5.97	9.28	<2
60770	<1	<0.1	30.9	178	336	5.6	<10	0.36	20.9	5.18	13.6	5.39	17.0	<2
60771	<1	<0.1	122	116	88.7	17.3	23	1.39	76.6	13.0	10.5	6.36	9.10	<2
60772	<1	<0.1	101	90.4	133	17.8	20	1.07	67.1	10.4	10.0	6.54	10.2	<2
60773	4.0	0.59	57.8	220	225	19.0	29	1.13	54.4	13.3	11.2	7.70	13.9	14.7
60774	<1	<0.1	14.2	133	319	4.5	13	0.31	11.4	5.87	10.9	3.91	15.8	2.7
60775	2.4	0.29	57.4	249	189	17.2	24	1.19	60.1	13.2	10.4	7.17	12.9	10.2

7491 TRONDHEIM
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ICP-AES ANALYSER
GEOLOGISK MATERIALE
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NORSK AKKREDITERING TEST 020
7491 TRON
Tlf.: 73 90 4
Telefaks: 7

Prøve ID	Si [mg/kg]	Al [mg/kg]	Fe [mg/kg]	Ti [mg/kg]	Mg [mg/kg]	Ca [mg/kg]	Na [mg/kg]	K [mg/kg]	Mn [mg/kg]	P [mg/kg]	Cu [mg/kg]	Zn [mg/kg]	Pb [mg/kg]	Ni [mg/kg]	Co [mg/kg]	V [mg/kg]
60776	<250	25600	43800	13.7	13100	20600	911	6460	358	450	69.4	89.9	25.4	91.6	26.5	42.1
60777	<250	25600	30600	16.9	7720	16000	581	8490	176	1040	115	178	46.8	107	23.4	189
60778	<250	27800	41400	13.1	14100	19100	870	6490	341	733	70.2	75.0	29.4	82.6	23.6	44.9
60779	<250	27200	43100	11.9	13700	10400	618	6050	279	430	70.8	104	35.9	90.5	26.3	45.3
60780	<250	28200	50000	12.3	14400	16500	709	5540	315	443	113	907	38.6	104	25.5	46.2
60781	<250	27200	41400	13.7	14100	11000	803	6290	309	405	59.6	76.0	30.1	79.0	24.4	43.1
60782	<250	28700	36500	15.9	13500	18500	816	6590	306	1780	49.3	60.6	13.2	79.2	25.6	48.4
60783	<250	28200	33900	12.8	13800	17200	795	6390	341	513	51.6	55.6	5.0	68.1	17.0	56.6
60784	<250	28100	37400	14.2	13500	67400	713	5790	477	376	40.0	46.6	4.3	43.1	14.0	54.6
60791	<250	17300	43200	197	3930	63600	306	6960	222	875	118	403	16.5	89.1	21.4	221
60792	<250	18500	51500	228	3570	29600	290	7690	272	1190	132	293	52.1	153	28.8	286
60793	<250	18600	43100	134	3190	28900	314	7780	256	815	156	123	35.7	144	29.3	263
60794	<250	17400	49200	117	2700	9110	295	7280	208	908	160	124	29.8	114	29.9	224
60795	<250	17900	62700	121	2830	12500	310	7420	178	1080	157	171	33.7	220	33.3	324
60796	<250	16700	44000	114	3560	22200	300	7060	255	1180	156	110	28.2	133	31.7	206
60797	<250	11900	19800	94.3	9000	170000	258	4950	743	1150	62.9	82.5	12.5	58.8	11.7	176
60798	<250	18000	58300	101	2390	5220	300	7530	136	736	198	138	33.5	145	32.4	202
60799	365	16500	41600	98.6	3340	21200	304	6940	242	1140	169	109	27.5	118	28.5	196
60800	<250	18300	43200	112	3380	13100	302	7530	232	982	167	126	28.2	123	29.0	219
60801	<250	16800	48100	87.2	3580	18500	308	7090	220	817	170	121	30.4	134	29.8	167
60802	<250	3180	4940	38.3	5000	295000	227	1400	685	550	17.9	13.9	<2	14.2	2.52	62.5
60803	<250	13100	52800	80.2	4410	54600	304	5530	310	952	123	99.5	24.1	104	24.7	155
60804	<250	17200	40500	107	4690	71900	283	7120	382	1120	120	98.0	23.2	108	23.1	213
60805	<250	18700	53600	105	2830	14300	300	7660	170	910	189	200	34.3	200	33.4	210
60806	<250	16300	42600	87.4	7660	76000	285	6730	387	757	132	117	23.3	95.3	22.3	153
60807	<250	18900	48500	103	2440	5800	297	7780	134	930	167	254	33.8	228	30.6	312
60808	<250	13400	41800	77.2	5870	82500	272	5630	437	713	124	102	23.0	138	24.8	154
60809	<250	19800	45600	138	3340	18000	328	8020	182	1620	175	120	37.4	185	32.0	302
60810	<250	3800	6860	42.5	4870	292000	213	1660	694	564	20.9	17.9	<2	18.5	3.12	75.2
60811	<250	16800	47500	117	2860	27800	294	6860	268	1110	128	143	30.0	160	33.0	242
60812	<250	14600	43600	95.7	2760	29300	303	6090	217	1000	146	112	29.5	133	29.1	203
60813	<250	14000	44100	85.3	2440	24700	283	5930	197	1150	159	124	31.4	148	29.7	233
60814	<250	13100	62900	87.8	2260	24500	288	5470	204	1120	158	112	30.1	133	26.9	216
60815	<250	14500	50800	95.5	2410	10100	283	6070	227	1500	159	115	29.1	117	29.3	179

ICP-AES *)NGU-lab er ikke akkreditert for Si (geologisk materiale).

ICP-AES ANALYSER
GEOLOGISK MATERIALE
ANALYSEKONTRAKTNR. 2009.0122

NORSK AKKREDITERING TEST 020

Prøve ID	Mo [mg/kg]	Cd [mg/kg]	Cr [mg/kg]	Ba [mg/kg]	Sr [mg/kg]	Zr [mg/kg]	B [mg/kg]	Be [mg/kg]	Li [mg/kg]	Sc [mg/kg]	Ce [mg/kg]	La [mg/kg]	Y [mg/kg]	As [mg/kg]
60776	<1	0.11	47.7	235	140	15.1	22	1.18	51.6	11.7	9.8	7.11	9.80	10.8
60777	35.4	0.72	24.6	233	92.9	52.0	29	1.83	44.1	5.63	15.2	8.49	21.2	16.9
60778	<1	<0.1	53.8	255	134	14.6	23	1.13	58.9	12.1	11.4	6.95	12.3	5.6
60779	<1	0.11	56.2	186	88.4	14.0	21	1.10	59.9	11.7	11.6	7.60	9.03	8.6
60780	<1	2.74	55.2	221	119	14.8	19	0.98	67.1	10.0	10.8	7.87	10.2	11.7
60781	<1	<0.1	53.0	202	93.4	13.9	22	1.18	58.6	11.6	10.5	7.17	8.71	7.7
60782	<1	<0.1	57.0	189	121	15.9	22	1.12	59.4	11.5	16.8	7.82	16.7	3.4
60783	<1	<0.1	54.5	194	122	13.6	21	1.23	61.7	13.1	13.8	7.83	11.3	<2
60784	<1	<0.1	36.8	165	230	11.6	19	1.25	66.6	11.7	14.7	8.66	12.9	<2
60791	102	6.83	19.4	243	180	57.6	11	1.99	12.4	6.17	68.5	36.8	30.0	15.4
60792	124	5.49	22.4	218	236	60.7	11	2.15	13.8	5.10	73.0	39.3	36.9	67.0
60793	114	1.99	21.2	179	144	52.3	17	3.09	13.3	5.64	63.6	34.6	27.8	85.1
60794	132	2.10	20.0	142	85.1	51.5	18	2.55	11.1	5.54	71.5	38.8	30.2	74.8
60795	128	3.68	22.6	205	123	54.8	19	2.68	10.6	4.78	69.9	38.0	34.4	115
60796	129	1.88	20.0	185	169	49.2	18	2.47	10.8	6.74	70.6	37.2	38.7	73.2
60797	51.0	1.09	11.7	262	688	27.6	16	1.43	8.41	7.41	47.8	24.1	41.1	30.9
60798	124	3.77	23.2	166	63.7	61.6	20	2.64	10.7	4.32	56.3	32.0	26.6	93.7
60799	142	1.62	18.4	197	162	50.7	19	2.48	11.3	6.05	66.8	35.1	36.2	63.2
60800	142	1.64	20.4	178	122	51.1	21	2.51	11.8	6.12	68.7	35.9	36.8	61.8
60801	135	2.14	19.9	222	260	57.8	19	2.57	11.8	6.02	53.1	29.5	32.1	76.6
60802	13.3	0.27	3.06	971	1010	5.9	<10	0.55	2.89	1.08	14.9	7.28	13.4	7.7
60803	111	1.90	14.8	242	311	41.0	15	1.89	10.3	5.89	39.9	23.2	30.4	68.7
60804	111	1.84	18.1	211	356	41.9	20	1.99	11.5	6.06	46.6	25.4	35.3	63.1
60805	152	4.22	22.5	146	94.7	61.7	21	2.60	11.3	7.24	65.9	35.4	34.3	95.3
60806	120	1.80	18.0	258	370	46.0	19	2.06	12.0	6.17	42.6	24.1	35.2	64.6
60807	153	5.00	22.7	292	62.4	57.8	22	2.79	11.3	5.23	63.3	35.4	32.6	83.9
60808	110	2.29	15.0	201	550	43.2	16	1.72	9.45	4.88	38.0	21.3	30.1	68.9
60809	134	3.35	23.0	172	132	58.2	24	2.91	13.1	5.61	72.7	35.6	51.7	81.8
60810	16.2	0.36	3.68	903	1000	6.8	<10	0.58	3.09	0.99	15.4	7.23	12.6	11.7
60811	119	1.96	18.9	179	171	53.4	18	2.33	10.8	5.46	57.1	31.2	36.6	62.7
60812	120	1.83	16.3	160	179	51.2	16	2.22	9.25	5.26	56.2	30.0	31.1	61.5
60813	123	2.19	16.6	251	164	51.2	16	2.40	10.1	5.30	55.4	29.9	36.9	70.0
60814	113	2.15	15.4	132	178	49.7	15	2.23	9.35	5.07	47.2	26.7	36.1	90.3
60815	144	1.91	16.5	176	108	52.5	16	2.31	10.6	5.79	65.0	33.3	44.8	67.5

NGU Norges geologiske undersøkelse

7491 TRONDHEIM
Tlf.: 73 90 40 00
Telefaks: 73 92 16 20

Totalt karbon / Totalt svovel / Totalt organisk karbon
GEOLOGISK MATERIALE
Analysekontrakt nr. 2009.0122

NORSK AKKREDITERING TEST 020

INSTRUMENT: **Leco SC-444**

METODER: **BESTEMMELSER AV TOTALT KARBON (TC) / TOTALT SVOVEL (TS) / TOTALT ORGANISK KARBON (TOC)**
Forbrenningsanalyser i henhold til metodebeskrivelser i NGU-SD 2.14, NGU-SD 2.15 og NGU-SD 2.16.

I) TOTALT KARBON (TC)

Nedre bestemmelsesgrense [% C]: **0.07**

Analyseusikkerhet

Måleområde	Usikkerhet
0.07 - 0.5 %	± 0.07 %
> 0.5 %	± 15 % rel.

II) TOTALT SVOVEL (TS)

Nedre bestemmelsesgrense [% S]: **0.01**

Analyseusikkerhet

Måleområde	Usikkerhet
0.01 - 3.0 %	± 30 % rel.
> 3.0 %	± 20 % rel.

III) TOTALT ORGANISK KARBON (TOC)

Nedre bestemmelsesgrense [% TOC]: **0.1**

Analyseusikkerhet

Måleområde	Usikkerhet
0.1 - 3.0 %	± 25 % rel.
> 3.0 %	± 20 % rel.

Oppgitte usikkerheter har dekningsfaktor 2 (2 standardavvik), noe som tilsvarer et konfidensintervall på 95 %.

PRESISJON : Det analyseres rutinemessig kontrollprøver som føres i kontrolldiagram (X-diagram). Disse kan forevises om ønskelig.

ANTALL PRØVER: 106

ANMERKNINGER: TS og TC er analysert med tilsats av katalysator.

Gjengivelse av analysedata skal skje på en slik måte at meningsinnholdet i rapporten ikke endres.

Ferdig analysert	13. aug. 2009	Anne Nordtømme
	Dato	OPERATØR

Norges geologiske undersøkelse
7491 TRONDHEIM
Tlf.: 73 90 40 00
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NORSK AKKREDITERING TEST 020

Prøve ID	Svovel [%]	Karbon [%]	TOC [%]
60701	0.45	0.92	0.35
60702	0.37	0.69	0.39
60703	0.41	1.16	0.34
60704	0.31	1.22	0.42
60705	0.30	1.53	0.41
60706	0.46	1.48	0.44
60707	0.03	1.70	0.57
60708	0.02	2.29	0.39
60709	0.17	1.51	0.52
60710	0.31	1.59	0.60
60711	0.98	2.04	0.93
60712	0.53	4.21	1.01
60713	1.38	2.75	1.39
60714	0.25	13.9	3.36
60715	1.00	1.67	0.77
60716	1.05	1.15	0.72
60717	0.90	2.21	0.92
60718	1.55	2.43	1.13
60719	0.17	4.63	0.85
60720	0.47	14.2	3.35
60721	1.60	3.01	1.71
60722	0.35	2.86	0.60
60723	1.20	1.37	0.88
60724	0.18	14.1	3.26
60725	0.05	8.00	0.36
60726	0.10	2.52	0.52
60727	0.07	1.59	0.30
60728	0.02	1.86	0.38
60729	0.01	1.68	0.28
60730	0.11	1.30	0.27
60731	0.03	3.65	0.22
60732	1.30	1.68	0.61
60733	0.30	1.94	0.46
60734	0.45	1.69	0.42
60735	0.18	14.4	3.45
60737	0.24	1.77	0.34
60738	0.04	2.07	0.47
60739	0.60	2.60	0.57
60740	1.49	0.95	0.63
60741	1.35	0.95	0.61
60742	1.62	1.36	0.51
60743	0.99	1.15	0.48
60744	1.22	1.12	0.38
60745	0.55	1.22	0.38
60746	0.75	1.09	0.41
60747	1.20	1.49	0.51
60748	1.15	1.26	0.65
60749	1.85	1.75	1.00
60750	1.60	1.33	0.50
60751	0.28	1.31	0.38
60752	0.25	14.1	3.53
60753	0.41	1.64	0.40
60754	0.72	1.19	0.44
60755	0.85	1.09	0.38
60756	0.39	1.18	0.44

7491 TRONDHEIM
Tlf.: 73 90 40 00
Telefaks: 73 92 16 20

Totalt karbon / Totalt svovel / Totalt organisk karbon
GEOLOGISK MATERIALE
Analysekontrakt nr. 2009.0122

Prøve ID	Svovel [%]	Karbon [%]	TOC [%]
60757	0.51	1.56	0.53
60758	0.42	1.93	0.40
60759	0.25	2.27	0.31
60760	0.70	1.93	0.57
60761	0.65	3.24	0.71
60762	1.64	1.92	1.54
60763	0.43	0.47	0.24
60765	0.89	1.85	0.69
60766	0.21	0.99	0.41
60768	0.08	1.53	0.45
60769	0.14	1.23	0.32
60770	0.06	7.42	< 0.1
60771	0.23	1.30	0.31
60772	0.81	1.40	0.45
60773	2.32	3.31	1.96
60774	0.41	9.64	0.23
60775	1.66	2.82	1.86
60776	1.84	1.49	0.75
60777	1.21	4.60	4.17
60778	1.37	1.76	0.99
60779	1.33	1.43	1.14
60780	1.79	1.68	1.21
60781	1.23	1.25	0.81
60782	0.51	1.28	0.64
60783	0.05	1.02	0.34
60784	0.06	3.01	0.50
60791	3.15	12.8	10.6
60792	5.70	13.1	12.1
60793	5.28	11.9	11.0
60794	5.47	11.6	11.2
60795	7.96	11.2	10.9
60796	5.47	11.4	10.8
60797	2.38	14.2	7.78
60798	5.57	9.66	9.51
60799	4.55	12.1	11.3
60800	4.25	11.4	11.0
60801	6.02	10.9	10.2
60802	0.13	14.4	3.29
60803	6.83	11.7	9.80
60804	5.28	12.4	9.90
60805	6.67	9.74	9.21
60806	5.46	10.7	7.81
60807	4.83	10.5	10.3
60808	5.21	11.2	8.08
60809	5.77	13.0	12.1
60810	0.37	14.9	4.03
60811	5.72	12.5	11.6
60812	5.35	13.7	12.4
60813	5.71	13.7	12.4
60814	6.90	13.0	11.9
60815	6.28	12.2	11.7

Løpenr.	SiO_2%	Al_2O_3%	Fe_2O_3%	MnO%	MgO%	CaO%	Na_2O%	K_2O%	TiO_2%	P_2O_5%	BaO%	L.O.I.%	SUM%
1	55.78	16.92	7.14	0.07	4.24	2.16	1.09	3.61	0.79	0.07	0.05	6.22	98.14
2	57.26	17.46	7.22	0.05	4.3	1.32	1.06	3.75	0.83	0.08	0.05	5.76	99.14
3	54.52	16.87	7.04	0.08	4.11	3.34	0.96	3.63	0.77	0.06	0.05	6.85	98.28
4	53.73	17.32	7.12	0.07	4.1	3.57	0.92	3.77	0.78	0.07	0.05	7.16	98.66
5	50.77	17.62	7.42	0.08	4.09	4.78	0.76	3.97	0.76	0.07	0.05	8.13	98.50
6	51.72	17.59	7.69	0.07	3.85	4.17	0.85	3.9	0.78	0.08	0.10	7.73	98.53
7	43.41	19.91	10.56	0.07	4.69	5.23	0.61	4.05	0.83	0.26	0.05	9.39	99.06
8	46.93	16.96	7.84	0.09	3.52	7.94	0.79	3.64	0.71	0.2	0.05	10.48	99.15
9	51.26	18.3	7.11	0.06	3.47	4.44	0.68	4.29	0.78	0.23	0.06	7.72	98.40
10	49.85	18.49	7.62	0.06	3.6	4.42	0.77	4.18	0.79	0.3	0.05	7.99	98.12
11	48.51	18.66	7.79	0.06	3.51	5.17	0.7	4.28	0.77	0.16	0.06	8.46	98.13
12	41.08	14.19	5.68	0.07	2.55	14.24	0.69	3.24	0.58	0.17	0.06	14.34	96.89
13	47.92	17.68	7.09	0.06	2.91	6.24	0.86	4.11	0.75	0.25	0.07	8.82	96.76
14	5.79	1.68	0.92	0.11	1	46.82	0.04	0.43	0.1	0.13	0.18	40.29	97.49
15	52.08	17.57	6.97	0.05	2.96	4.24	1.02	4	0.76	0.24	0.05	6.91	96.85
16	52.82	19.26	7.99	0.04	3.2	2.11	0.99	4.32	0.87	0.36	0.06	6.49	98.51
17	50.11	18.01	6.09	0.05	2.65	5.7	0.72	4.4	0.69	0.13	0.06	8.19	96.80
18	48.09	18.08	7.88	0.06	3.13	5.6	0.7	4.1	0.72	0.1	0.06	7.84	96.36
19	38.72	13.31	5.97	0.11	2.69	16.49	0.59	2.79	0.58	0.11	0.05	16.5	97.91
20	5.85	1.71	0.93	0.11	0.98	46.59	0.04	0.44	0.09	0.14	0.18	40.22	97.28
21	47.57	17.66	7.24	0.06	2.94	6.2	0.96	4.05	0.74	0.12	0.05	8.72	96.31
22	46.26	16.39	6.23	0.08	3.05	9.58	0.72	3.77	0.69	0.11	0.06	11.35	98.29
23	52.38	19.73	7.81	0.04	3.15	1.98	0.98	4.53	0.85	0.1	0.07	6.6	98.22
24	5.5	1.61	0.88	0.11	0.97	47.02	0.03	0.4	0.09	0.13	0.18	40.54	97.46
25	22.46	6.27	2.56	0.15	1.21	35.13	0.36	1.36	0.25	0.12	0.02	29.08	98.97
26	48.31	15.68	6.75	0.1	3.33	8.64	0.7	3.5	0.7	0.17	0.05	11.08	99.01
27	52	17.47	7.06	0.06	3.48	5.24	0.87	3.88	0.8	0.23	0.05	8.44	99.58
28	47.95	17.8	7.8	0.08	3.54	6.56	0.71	3.97	0.77	0.18	0.07	9.78	99.21
29	48.69	17.96	8.28	0.08	3.69	6.06	0.8	3.81	0.79	0.13	0.05	9.43	99.77

Løpenr.	SiO_2%	Al_2O_3%	Fe_2O_3%	MnO%	MgO%	CaO%	Na_2O%	K_2O%	TiO_2%	P_2O_5%	BaO%	L.O.I.%	SUM%
30	47.22	19.64	9.35	0.07	4.2	4.38	0.75	4.23	0.85	0.25	0.06	8.27	99.27
31	38.45	13.82	8.03	0.17	3.47	15.28	0.62	2.64	0.59	0.31	0.04	15.53	98.95
32	50.26	17.39	8.02	0.07	3.54	5.16	0.78	3.97	0.73	0.08	0.04	8.21	98.25
33	48.73	16.88	7.28	0.09	3.74	6.99	0.79	3.75	0.71	0.13	0.04	9.7	98.83
34	51.16	16.9	7.41	0.08	3.72	5.52	0.81	3.76	0.73	0.08	0.04	8.57	98.78
35	5.89	1.72	0.93	0.11	0.97	46.53	0.04	0.41	0.1	0.13	0.18	40.23	97.24
36	50.92	16.3	7.51	0.09	3.66	6.5	0.8	3.47	0.72	0.16	0.04	9.18	99.35
37	47.66	17.69	7.56	0.08	3.7	7.23	0.76	3.9	0.75	0.3	0.05	9.86	99.54
38	45.44	16.91	7.7	0.09	3.58	8.84	0.71	3.77	0.73	0.18	0.05	10.59	98.59
39	56.54	17.45	7.36	0.04	3.74	1.46	0.89	4.18	0.79	0.07	0.05	5.86	98.43
40	55.86	17.64	7.52	0.05	4.24	1.35	0.82	4.08	0.79	0.08	0.06	6.23	98.72
41	53.5	16.36	7.55	0.09	4.3	3.7	0.95	3.64	0.75	0.07	0.05	7.04	98.00
42	55.87	16.6	7.1	0.07	4.46	2.94	1.06	3.53	0.77	0.08	0.04	6.36	98.88
43	54.49	16.8	7.39	0.08	4.28	2.92	1	3.74	0.79	0.07	0.05	6.79	98.40
44	53.35	16.76	7.63	0.08	4.2	3.79	0.95	3.6	0.77	0.09	0.05	7.14	98.41
45	57.39	16.18	6.77	0.07	4.01	2.94	1.17	3.49	0.79	0.09	0.04	6.21	99.15
46	53.02	16.19	7.53	0.09	4.01	4.13	0.96	3.63	0.74	0.07	0.05	6.94	97.36
47	56.33	16.79	7.33	0.07	4.02	2.11	1	3.83	0.79	0.07	0.05	6.35	98.74
48	54.12	16.72	7.95	0.06	3.9	2.69	0.81	3.87	0.75	0.07	0.08	7.32	98.34
49	55.04	16.21	7.71	0.07	3.84	3.11	0.97	3.65	0.75	0.08	0.04	5.95	97.42
50	55.14	16.24	6.46	0.08	3.86	3.95	1.08	3.57	0.77	0.07	0.05	7.28	98.55
51	5.91	1.69	0.93	0.11	0.97	46.78	0.03	0.41	0.09	0.13	0.18	40.18	97.41
52	50.92	16.53	7.46	0.1	4.34	5.46	0.93	3.48	0.75	0.06	0.04	8.49	98.56
53	54.15	16.96	7.7	0.07	4.12	3.22	0.99	3.71	0.78	0.07	0.04	6.93	98.74
54	54.1	17.43	7.82	0.06	4.08	2.69	0.96	3.89	0.78	0.07	0.04	6.81	98.73
55	52.98	17.73	7.14	0.07	4.13	3.41	0.85	4.07	0.78	0.08	0.05	7.45	98.74
56	53.34	17.31	6.7	0.08	3.69	4.3	0.86	4.06	0.77	0.07	0.06	7.73	98.97
57	50.04	16.6	7.13	0.09	3.79	6.44	0.81	3.74	0.71	0.08	0.04	9.32	98.79
58	47.38	15.72	7.32	0.11	3.86	8.98	0.74	3.4	0.67	0.75	0.05	10.39	99.37

Løpenr.	SiO_2%	Al_2O_3%	Fe_2O_3%	MnO%	MgO%	CaO%	Na_2O%	K_2O%	TiO_2%	P_2O_5%	BaO%	L.O.I.%	SUM%
59	48.38	18.17	8.09	0.07	4.04	5.05	0.7	4.17	0.76	0.09	0.04	8.83	98.39
60	47.23	13.69	6.41	0.12	2.91	11.24	0.54	3.15	0.58	0.29	0.05	11.83	98.04
61	51.57	18.72	8.93	0.04	3.69	1.73	0.68	4.45	0.78	0.12	0.05	8.08	98.84
62	57.86	20.33	5	0.02	2.23	0.94	0.74	5.55	1.17	0.45	0.08	5.13	99.50
63	53.26	17.22	7.64	0.06	3.41	3.83	0.9	3.96	0.74	0.11	0.06	7.24	98.43
64	49.29	19.92	9.5	0.05	4.36	2.55	0.8	4.33	0.85	0.24	0.06	7.22	99.17
65	48.58	18.21	8.27	0.07	4.03	5.05	0.75	4.01	0.78	0.28	0.06	8.81	98.90
66	53.58	16.74	7.81	0.08	4.57	3.88	0.92	3.37	0.78	0.07	0.05	7.64	99.49
67	31.73	4.74	2.73	0.51	1.65	30.33	0.5	0.86	0.22	0.1	0.03	25.36	98.76
68	53.15	17.32	7.7	0.1	4.91	3.21	0.91	3.69	0.82	0.07	0.05	8.06	99.99
69	53.71	16.54	7.29	0.08	4.07	3.58	0.97	3.66	0.76	0.08	0.04	7.29	98.07
70	48.01	16.8	8.21	0.06	2.86	5.84	0.99	3.77	0.72	0.16	0.06	9.22	96.70
71	18.42	3.71	1.88	0.17	1.21	39.39	0.37	0.67	0.16	0.23	0.03	31.51	97.75
72	48.35	18.24	7.98	0.05	3.13	4.42	1.01	4.14	0.79	0.18	0.06	10.14	98.49
73	51.45	18.41	8.06	0.05	3.04	3.09	1.02	4.35	0.8	0.11	0.06	7.14	97.58
74	54.83	17.61	5.69	0.02	2.05	2.3	0.44	4.73	0.97	0.26	0.07	9.71	98.68
75	51.38	18.82	7.77	0.05	3.19	2.86	1.02	4.32	0.82	0.19	0.06	7.48	97.96
76	53.45	19.08	8.05	0.04	3.11	1.56	1.03	4.41	0.84	0.11	0.06	6.85	98.59
77	50.61	18.84	9.15	0.04	3.2	2.41	0.99	4.22	0.85	0.11	0.06	7.35	97.83
78	54.24	19.03	7.75	0.04	3.19	1.61	1.06	4.4	0.89	0.11	0.06	6.68	99.06
79	54.33	18.37	6.92	0.04	3.03	2.76	1.14	4.14	0.86	0.43	0.05	6.4	98.47
80	55.46	18.72	6.68	0.05	3.12	2.63	1.19	4.2	0.9	0.14	0.06	6.42	99.57
81	45.38	15.75	7.12	0.07	2.89	10.23	1	3.31	0.75	0.09	0.05	11.23	97.87
82	40.65	12.79	7.38	0.03	1.08	9.31	0.47	3.74	0.67	0.2	0.17	21.46	97.95
83	45.09	13.22	8.8	0.03	1.04	4.36	0.47	3.98	0.7	0.27	0.18	21.06	99.20
84	46.6	13.62	7.48	0.03	1.05	4.25	0.51	4.23	0.73	0.19	0.17	19.15	98.01
85	49.5	14.07	8.56	0.03	0.99	1.33	0.53	4.43	0.74	0.21	0.18	18.89	99.46
86	44.03	12.76	10.86	0.02	0.95	1.83	0.49	4.13	0.71	0.24	0.17	20.1	96.29
87	47.97	13.55	7.66	0.03	1.13	3.27	0.51	4.36	0.72	0.27	0.20	19.05	98.72

Løpenr.	SiO_2%	Al_2O_3%	Fe_2O_3%	MnO%	MgO%	CaO%	Na_2O%	K_2O%	TiO_2%	P_2O_5%	BaO%	L.O.I.%	SUM%
88	25.03	6.8	3.39	0.12	1.85	25.86	0.24	1.96	0.36	0.28	0.13	25.9	91.92
89	48.18	14.56	9.83	0.01	0.98	0.72	0.53	4.51	0.78	0.16	0.18	17.85	98.29
90	48.01	13.65	7.04	0.03	1.13	3.06	0.48	4.21	0.72	0.26	0.20	19.53	98.32
91	49.46	14.1	7.36	0.03	1.11	1.9	0.53	4.43	0.75	0.23	0.20	18.74	98.84
92	48.15	14.19	8.32	0.02	1.22	2.74	0.45	4.25	0.76	0.19	0.17	19.07	99.53
93	5.58	1.59	0.87	0.12	0.97	47.41	0.04	0.37	0.09	0.13	0.18	38.99	96.34
94	40.46	11.5	9.36	0.04	1.28	8.22	0.42	3.52	0.6	0.22	0.19	20.59	96.40
95	39.11	11.28	7.19	0.06	1.27	10.98	0.38	3.42	0.6	0.27	0.17	24.07	98.80
96	48.17	14.46	9.22	0.02	1.05	2.09	0.51	4.38	0.76	0.21	0.17	18.15	99.19
97	38.58	11.49	7.45	0.05	1.81	11.38	0.38	3.44	0.6	0.18	0.16	19.46	94.98
98	49.47	14.9	8.41	0.02	1.02	0.83	0.51	4.55	0.79	0.22	0.18	18.08	98.98
99	38.58	10.98	7.1	0.06	1.49	12.17	0.33	3.26	0.56	0.17	0.16	20.05	94.91
100	46.63	13.7	8.04	0.02	1.1	2.71	0.49	4.22	0.72	0.39	0.18	20.96	99.16
101	6.41	1.79	1.18	0.11	0.96	45.89	0.03	0.45	0.1	0.13	0.17	38.97	96.19
102	45.53	13.02	8.22	0.04	1.04	4.12	0.42	3.93	0.7	0.27	0.17	21.16	98.62
103	45.37	13.1	7.38	0.03	1.05	4.24	0.42	4	0.69	0.23	0.18	21.88	98.57
104	45.45	13.37	7.71	0.02	1.01	3.72	0.44	4.06	0.7	0.27	0.19	22.02	98.96
105	42.72	12.46	10.97	0.02	0.95	3.67	0.39	3.82	0.67	0.27	0.17	22.9	99.01
106	48.45	13.64	8.58	0.03	0.99	1.45	0.48	4.3	0.73	0.35	0.20	20.12	99.32

Løpenr.	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm
1	213	443	32	168	45	105	146	8	126	24	199	14	10	5
2	209	433	24	157	59	89	151	12	98	30	207	14	10	4
3	212	418	25	159	84	118	151	13	162	25	193	14	11	7
4	224	365	24	155	62	113	157	9	175	25	189	14	10	5
5	199	265	25	140	58	71	166	12	243	24	169	13	10	7
6	219	268	24	125	59	82	162	11	220	22	173	13	11	6
7	231	263	28	153	26	98	170	8	272	25	172	14	11	7
8	206	226	20	117	64	80	159	7	355	26	152	12	9	9
9	219	218	27	105	79	95	173	10	211	26	162	13	9	6
10	203	218	29	115	51	69	171	15	229	29	165	13	10	10
11	188	219	28	129	83	104	172	25	254	29	155	13	9	10
12	165	178	27	117	75	140	147	19	457	34	121	10	8	13
13	195	223	26	129	94	86	167	30	327	28	139	11	10	11
14	199	16	9	35	38	34	54	12	1474	36	45	1	4	56
15	168	187	27	86	65	78	158	23	207	33	137	11	9	8
16	168	207	29	99	56	91	166	29	149	37	150	12	10	10
17	178	202	28	116	74	86	178	27	255	30	132	12	8	8
18	218	223	34	142	86	254	166	35	257	24	131	11	9	10
19	163	189	18	117	76	55	130	13	551	40	125	9	8	10
20	196	10	6	35	39	36	53	9	1476	37	44	1	4	51
21	202	196	33	121	84	313	165	32	310	29	131	12	8	12
22	184	209	21	101	76	86	162	13	365	28	149	12	9	8
23	181	212	31	102	62	84	177	32	161	25	143	12	9	8
24	208	10	0	33	37	33	53	15	1498	36	44	0	1	48
25	86	86	13	53	42	98	86	11	411	38	76	4	4	8
26	197	195	22	101	53	88	148	7	272	32	152	12	11	6
27	201	211	22	100	74	77	160	8	214	27	166	13	13	7
28	211	219	27	113	61	69	168	10	268	25	164	13	11	9
29	231	257	22	120	77	72	161	6	254	22	172	13	11	8

Løpenr.	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm
30	238	270	25	133	56	77	176	10	196	23	180	14	10	7
31	185	239	24	123	79	77	123	5	359	32	136	10	7	6
32	187	246	39	131	44	70	160	41	258	24	153	12	8	8
33	201	262	26	130	57	71	162	13	317	24	155	13	11	8
34	196	253	28	119	68	93	158	16	272	24	162	14	10	7
35	202	17	2	35	41	42	51	13	1470	36	44	2	2	55
36	203	253	28	126	52	79	149	8	295	27	164	12	9	6
37	219	226	23	111	53	65	164	9	319	30	158	13	9	7
38	193	209	36	116	51	68	159	17	310	29	155	13	9	10
39	195	266	28	155	32	71	170	36	89	26	191	16	10	6
40	191	314	28	167	42	86	170	15	90	26	183	14	10	9
41	180	329	34	172	44	90	155	13	167	27	192	14	11	6
42	190	399	28	175	43	80	151	14	149	28	202	14	9	6
43	191	337	27	151	41	106	159	13	148	29	199	15	12	6
44	187	337	29	157	39	74	156	15	194	27	184	13	10	8
45	191	427	27	149	47	90	148	16	155	29	214	14	10	7
46	186	329	33	157	46	109	156	31	207	30	191	13	11	7
47	195	355	32	171	43	93	160	26	105	31	203	15	10	9
48	229	295	34	209	46	150	163	61	151	25	183	14	12	8
49	187	368	36	181	43	95	155	36	180	27	194	14	11	7
50	205	414	27	140	53	70	152	14	191	25	204	13	11	6
51	204	12	4	36	41	32	55	11	1477	37	46	1	1	55
52	220	386	30	159	45	73	153	12	252	27	191	15	11	8
53	186	328	33	155	41	69	159	13	170	25	187	14	10	8
54	196	338	34	152	45	70	161	24	159	26	172	13	11	7
55	205	292	25	137	52	74	171	9	189	27	181	14	11	9
56	191	260	29	132	54	88	171	19	206	25	181	14	10	4
57	197	251	24	126	56	103	162	13	311	26	162	12	10	5
58	188	258	25	133	52	69	152	15	373	47	153	12	10	8

Løpenr.	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm
59	207	274	38	142	46	68	175	17	242	21	155	13	11	9
60	195	216	28	124	40	55	145	35	373	30	140	11	8	10
61	266	221	48	184	42	70	179	73	114	21	164	14	9	11
62	181	98	12	40	39	85	200	16	162	53	222	24	24	21
63	193	246	38	135	40	79	163	30	198	23	160	13	9	8
64	234	289	32	149	69	97	176	9	155	24	176	15	12	6
65	220	237	28	119	76	69	166	8	218	24	161	14	11	9
66	222	387	30	190	60	157	141	11	167	23	196	13	10	5
67	74	132	20	63	14	72	58	9	445	37	76	3	3	9
68	215	372	22	161	65	133	156	7	136	26	198	14	12	7
69	199	379	38	167	37	64	153	15	177	27	183	13	12	5
70	210	197	35	142	102	336	149	44	267	27	129	10	9	14
71	53	43	10	38	25	88	56	3	438	37	54	1	1	11
72	222	208	39	140	94	212	163	43	243	28	139	11	9	13
73	174	186	35	99	68	93	165	28	182	25	143	12	10	5
74	739	123	31	127	111	183	181	51	145	60	200	22	16	38
75	172	205	30	102	71	85	169	35	183	29	144	13	11	8
76	165	205	33	110	67	106	168	40	135	25	142	13	9	8
77	176	210	35	120	99	835	164	43	163	25	146	11	9	10
78	168	214	31	97	58	87	171	32	142	25	153	13	9	10
79	171	209	34	99	49	69	164	18	167	34	159	13	11	9
80	213	212	26	89	55	69	167	11	175	30	169	13	10	6
81	191	136	24	61	38	64	146	12	298	32	156	12	9	8
82	685	112	21	89	127	436	175	22	237	56	155	15	14	133
83	824	112	29	145	102	246	151	49	264	54	135	16	13	185
84	673	108	35	176	157	130	159	43	188	47	154	17	17	136
85	617	103	35	144	152	123	149	32	116	46	144	17	15	130
86	855	108	42	252	156	169	140	40	147	50	140	17	13	174
87	587	96	41	157	156	114	150	37	204	64	145	17	13	132

Løpenr.	V ppm	Cr ppm	Co ppm	Ni ppm	Cu ppm	Zn ppm	Rb ppm	Pb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm	Th ppm	U ppm
88	546	70	19	94	87	108	101	21	897	90	99	11	10	194
89	578	95	40	160	191	137	149	37	90	39	155	18	14	158
90	624	97	35	143	163	113	151	37	197	57	150	17	15	141
91	618	100	36	152	163	129	153	34	156	59	148	17	13	138
92	554	95	38	149	166	121	147	36	294	51	153	17	14	169
93	202	20	1	33	37	33	50	7	1478	36	43	1	0	47
94	557	90	32	140	134	101	130	35	359	54	128	14	11	123
95	622	89	35	144	140	118	135	34	430	65	134	15	11	159
96	606	100	44	213	181	189	149	38	124	53	161	18	16	192
97	472	83	28	124	150	135	135	35	437	66	142	15	13	165
98	894	116	40	250	161	235	153	41	92	48	162	20	15	217
99	550	88	37	181	143	118	126	33	636	56	132	14	11	164
100	796	105	41	218	176	125	148	44	169	81	148	18	14	264
101	230	20	6	40	44	38	49	8	1484	32	43	1	1	46
102	791	103	41	190	139	157	142	36	208	60	142	18	14	195
103	752	103	39	164	157	119	147	38	217	52	147	17	13	147
104	866	122	34	178	163	124	146	38	204	59	148	17	14	188
105	824	108	36	167	159	116	129	36	203	53	130	16	12	175
106	621	103	36	138	160	115	141	31	138	68	141	16	11	143

Løpenr.	Ba ppm	S ppm	TC%	TOC%	TIC%	XRD Identification			
1	423	3663	0.80	0.34	0.46	Quartz, Chlorite, Illite, Albite, Pyrite, Calcite			
2	420	3180	0.69	0.33	0.36	Quartz, Chlorite, Albite, Illite, Pyrite			
3	491	3356	1.09	0.34	0.75	Quartz, Calcite, Chlorite, Illite			
4	451	1995	1.13	0.37	0.76	Quartz, Calcite, Illite, Albite, Chlorite			
5	486	2419	1.47	0.35	1.12	Quartz, Calcite, Chlorite, Illite, Albite			
6	935	2359	1.34	0.44	0.90	Quartz, Chlorite, Calcite, Illite, Albite			
7	443	501	1.62	0.52	1.09	Quartz, Chlorite, Calcite, Illite			
8	442	454	2.00	0.32	1.68	Quartz, Calcite, Albite, Illite, Chlorite			
9	579	1383	1.42	0.44	0.98	Quartz, Chlorite, Calcite, Illite, Albite			
10	457	2571	1.51	0.56	0.95	Quartz, Chlorite, Calcite, Illite, Albite			
11	536	5576	1.96	0.83	1.13	Quartz, Chlorite, Calcite, Pyrite, Albite			
12	514	5148	4.08	0.93	3.15	Quartz, Calcite, Pyrite, Chlorite, Illite			
13	591	9287	2.60	1.30	1.30	Quartz, Calcite, Pyrite, Chlorite, Illite			
14	1593	5083	13.46	3.19	10.27	Calcite, Quartz, Pyrite, Dolomite			
15	475	6802	1.60	0.75	0.85	Quartz, Calcite, Illite, Albite, Pyrite, Chlorite			
16	526	7764	1.06	0.72	0.34	Quartz, Pyrite, Chlorite, Albite, Calcite, Illite			
17	550	6482	2.11	0.84	1.27	Quartz, Calcite, Chlorite, Illite, Pyrite, Albite			
18	509	9449	2.25	1.19	1.06	Quartz, Calcite, Chlorite, Illite, Pyrite, Albite			
19	414	3605	4.48	0.78	3.70	Quartz, Calcite, Chlorite, Illite, Albite			
20	1615	5107	13.55	3.18	10.37	Calcite, Quartz, Pyrite, Dolomite			
21	470	10212	2.94	1.59	1.35	Quartz, Calcite, Chlorite, Pyrite, Illite, Albite			
22	531	2996	2.72	0.54	2.19	Quartz, Calcite, Chlorite, Illite, Albite, Illite			
23	654	8485	1.27	0.87	0.39	Quartz, Pyrite, Chlorite, Illite, Albite, Calcite			
24	1616	4909	13.55	3.10	10.45	Calcite, Quartz, Pyrite, dolomite			
25	187	1637	7.91	0.32	7.59	Calcite, Quartz, Illite, Chlorite			
26	447	1006	2.41	0.46	1.96	Quartz, Calcite, Chlorite, Illite			
27	436	676	1.42	0.30	1.11	Quartz, Calcite, Chlorite, Dolomite, Illite			
28	652	453	1.75	0.34	1.41	Quartz, Calcite, Chlorite, Illite, Albite			
29	430	135	1.50	0.25	1.25	Quartz, Calcite, Chlorite, Illite, Albite			

Løpenr.	Ba ppm	S ppm	TC%	TOC%	TIC%	XRD Identification			
30	549	875	1.17	0.28	0.88	Quartz, Chlorite, Calcite, Illite, Albite			
31	337	664	3.44	0.19	3.25	Quartz, Calcite, Chlorite, Illite, Albite			
32	371	7563	1.63	0.53	1.10	Quartz, Calcite, Pyrite, Illite, Chlorite			
33	365	2373	1.87	0.38	1.49	Quartz, Calcite, Illite, Chlorite, Albite			
34	357	2845	1.59	0.41	1.18	Quartz, Chlorite, Calcite, Illite, Albite			
35	1600	5070	13.56	3.20	10.36	Calcite, Quartz, Pyrite, dolomite			
36	384	1375	1.68	0.59	1.09	Quartz, Chlorite, Calcite, Illite, Albite			
37	421	537	1.89	0.41	1.48	Quartz, Calcite, Chlorite,Illite, Albite			
38	418	3800	2.39	0.55	1.84	Quartz, Calcite, Chlorite, Illite, Albite			
39	413	10599	0.84	0.43	0.41	Quartz, Pyrite, ChloriteIllitee, Albite			
40	501	9385	0.81	0.58	0.23	Quartz, Pyrite,Chlorite, Albite, Illite, Calcite			
41	404	10256	1.29	0.35	0.94	Quartz, Pyrite, Illite, Chlorite, Calcite, Albite			
42	367	7421	1.00	0.48	0.52	Quartz, Chlorite, Albite, Calcite, Pyrite, Illite			
43	423	6869	0.97	0.33	0.64	Quartz, Chlorite, Pyrite,Illite, Calcite, Albite			
44	415	4209	1.17	0.37	0.79	Quartz, Calcite, Chlorite, Pyrite, Albite, Illite			
45	337	5218	0.95	0.38	0.57	Quartz, Calcite, Illite, Pyrite, Chlorite, Albite			
46	478	8634	1.32	0.47	0.85	Quartz, Calcite, Chlorite, Pyrite, Albite, Illite			
47	439	9394	1.11	0.64	0.47	Quartz, Pyrite, Illite, Chlorite, Calcite, Albite			
48	704	14918	1.66	1.10	0.56	Quartz, Pyrite, Chlorite, Illite, Calcite, Albite			
49	371	11955	1.17	0.55	0.62	Quartz, Pyrite, Chlorite, Illite, Calcite, Albite			
50	436	2936	1.19	0.39	0.81	Quartz, Calcite, Albite, Chlorite, Illite			
51	1608	5081	13.62	3.18	10.44	Calcite, Quartz, Pyrite, Dolomite			
52	391	2768	1.57	0.35	1.22	Quartz, Calcite, Chlorite, Albite, Illite			
53	381	5304	1.09	0.39	0.70	Quartz, Illite, Chlorite, Calcite, Pyrite, Albite			
54	358	6620	0.96	0.40	0.55	Quartz, Pyrite, Chlorite, Calcite, Illite			
55	437	2160	1.09	0.35	0.74	Quartz, Chlorite, Calcite, Illite, Albite			
56	582	4317	1.40	0.45	0.95	Quartz, Calcite, Chlorite, Albite, Illite			
57	385	2335	1.74	0.35	1.39	Quartz, Calcite, Illite, Chlorite, Albite			
58	426	1772	2.05	0.31	1.74	Quartz, Calcite, Chlorite, Illite			

Løpenr.	Ba ppm	S ppm	TC%	TOC%	TIC%	XRD Identification			
59	396	4399	1.56	0.49	1.07	Quartz, Calcite, Chlorite, Illite, Pyrite, Albite			
60	439	5829	2.99	0.63	2.36	Quartz, Calcite, Chlorite, Pyrite, Illite, Albite			
61	448	12372	1.80	1.41	0.39	Quartz, Chlorite, Pyrite, Calcite, Albite, Illite			
62	691	2012	0.30	0.25	0.05	Quartz, Illite, Albite, Chlorite			
63	570	6467	1.41	0.63	0.77	Quartz, Chlorite, Pyrite, Illite, Albite			
64	522	1384	0.87	0.41	0.46	Quartz, Chlorite, Illite, Calcite, Albite			
65	505	646	1.41	0.37	1.04	Quartz, Calcite, Chlorite, Albite, Illite			
66	469	1214	1.13	0.28	0.85	Quartz, Chlorite, Calcite, Albite,Illite			
67	289	1383	6.91	0.09	6.81	Quartz, Calcite, Albite, Illite			
68	405	1684	1.13	0.29	0.84	Quartz, Chlorite, Albite, Calcite			
69	387	5947	1.21	0.41	0.80	Quartz, Calcite, Chlorite, Pyrite, Illite, Albite			
70	495	13463	3.99	1.72	2.27	Quartz, Pyrite, Calcite, Chlorite, Illite, Albite			
71	251	2457	8.94	0.18	8.76	Calcite, Quartz, Albite			
72	544	11230	2.76	1.75	1.01	Quartz, Calcite, Pyrite, Chlorite, Illite, Albite			
73	543	10727	1.41	0.71	0.71	Quartz, Pyrite, Chlorite, Illite, Calcite, Albite			
74	610	8512	4.28	3.75	0.53	Quartz, Illite,Chlorite, Calcite, Pyrite			
75	571	9234	1.58	0.94	0.65	Quartz, Chlorite, Pyrite, Calcite, Illite, Albite			
76	496	9801	1.44	1.02	0.42	Quartz, Pyrite, Chlorite, Albite, Illite			
77	530	12048	1.56	1.08	0.48	Quartz, Pyrite, Chlorite, Calcite, Illite			
78	520	8378	1.09	0.71	0.38	Quartz, Pyrite, Illite, Chlorite, Albite, Calcite			
79	487	4059	1.15	0.59	0.57	Quartz, Calcite, Chlorite, Illite, Pyrite, Albite			
80	505	511	0.85	0.28	0.58	Quartz, Chlorite, Illite, Albite, Calcite, Ankerite			
81	452	1129	2.81	0.42	2.39	Quartz, Calcite, Chlorite, Illite, Ankerite			
82	1523	15908	11.35	9.30	2.05	Quartz, Calcite, Pyrite, Illite			
83	1648	21603	11.61	10.66	0.95	Quartz, Pyrite, Calcite, Illite, Orthoclase			
84	1563	35431	10.68	9.65	1.03	Quartz, Pyrite, Calcite, Orthoclase, Illite, Albite, Ankerite			
85	1638	39646	10.40	10.04	0.36	Quartz, Pyrite, Orthoclase, Illite, Illite, Calcite, Dolomite-ferroan			
86	1516	53485	10.09	9.69	0.40	Quartz, Pyrite, Orthoclase, Calcite, Illite			
87	1758	39095	10.42	9.70	0.72	Quartz, Pyrite, Calcite, Orthoclase, Illite, Ankerite			

Løpenr.	Ba ppm	S ppm	TC%	TOC%	TIC%	XRD Identification			
88	1161	17820	13.16	6.97	6.19	Calcite, Quartz, Pyrite, Dolomite, Illite, Orthpclase, Albite			
89	1622	48458	8.83	8.64	0.19	Quartz, Pyrite, Illite, Microcline			
90	1762	36741	11.08	10.26	0.82	Quartz, Pyrite, Calcite, Orthoclase, Illite			
91	1810	38496	10.53	10.08	0.45	Quartz, Pyrite, Orthoclase, Calcite, Illite			
92	1567	41330	9.96	9.26	0.70	Quartz, Pyrite,Illite, Microcline			
93	1585	5005	13.66	3.08	10.58	Calcite, Quartz, Pyrite, Dolomite			
94	1680	40636	10.76	8.95	1.82	Quartz, Pyrite, Calcite, Illite, Orthoclase, Dolomite			
95	1492	37340	11.66	9.21	2.45	Quartz, Calcite, Pyrite, Illite, Dolomite			
96	1491	47125	8.96	8.57	0.39	Quartz, Pyrite, Calcite, Glauconite, Orthoclase, Albite			
97	1391	37047	9.78	7.06	2.72	Quartz, Calcite, Pyrite, Illite, Dolomite			
98	1649	44430	9.71	9.55	0.16	Quartz, Pyrite, Illite, Orthoclase			
99	1469	36212	10.11	7.25	2.86	Quartz, Calcite, Pyrite, Illite, Othoclase, Dolomite			
100	1614	41453	11.60	10.93	0.67	Quartz, Pyrite, Calcite, Illite, Orthoclase, Albite			
101	1529	6314	13.96	3.78	10.18	Calcite, Quartz, Pyrite, Dolomite			
102	1526	38254	11.47	10.52	0.95	Quartz, Calcite, Pyrite, Illite, Othoclase			
103	1576	36323	12.47	11.32	1.15	Quartz, Calcite, Pyrite, Illite, Othoclase			
104	1674	40033	12.63	11.58	1.05	Quartz, Pyrite, Calcite, Illite, Othoclase			
105	1514	48895	12.12	11.19	0.93	Quartz, Pyrite, Calcite, Illite, Othoclase			
106	1756	42387	11.11	10.78	0.33	Quartz, Pyrite, Orthoclase, Illite, Illite, Calcite			