REGISTERED OCCURRENCES OF TITANIFEROUS MAGNETITE, ILMENITE AND RUTILE IN NORWAY.

NGU-report no. 85.125.

Norges geologiske undersøkelse

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Rapport nr. 85.125	ISSN 0800-3416	Åpen/Fortrolig til xxxxxxxxx

Tittel:

REGISTERED OCCURRENCES OF TITANIFEROUS MAGNETITE, ILMENITE AND RUTILE IN NORWAY

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Oppdragsgiver: NGU

Fylke: Hele landet

Kommune: Hele landet

Kartbladnavn (M. 1:250 000)

Kartbladnr. og -navn (M. 1:50 000)

Forekomstens navn og koordinater:

Sidetall: 20 Pris: 24,-

Kartbilag:

Feltarbeid utført:	Rapportdato:	Prosjektnr.:	Prosjektleder:
1985		2300.13	Are Korneliussen

Sammendrag:

Som et tillegg (på engelsk) til en landsomfattende oversikt over norske Ti og Fe-Ti forekomster i NGU Bull. 402 "Titaniferous magnetite, ilmenite and rutile deposits in Norway", er det utarbeidet en tabellmessig oversikt over samtlige registrerte Ti/Fe-Ti forekomster i landet. Oversikten inneholder kortfattede opplysninger om geologi, gehalter og forekomststørrelser. Fordi den er ufullstendig, ble den ikke tatt med i NGU Bull. 402, men er i stedet utgitt i rapports form. Rapporten vil bli revidert på et senere tidspunkt i en norsk versjon.

Emneord	Malmgeologi jern titan	vanadium ilmenitt rutil fagrapport

Ref. no.(*)	Name of deposit	Map sheet (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt. conc.	% TiO2	Comments (**)
THE SEILAND PROVINCE							
Disseminated iron-titanium oxides (ITO) occur within Caledonian syn-orogenic intrusions of gabbronorite, olivine gabbro and hornblende clinopyroxenite.							
86-5	Halgavarre	1835 IV	55.3-06.0 55.5-05.3				Irreg. diss. of ITO (Geis 1968).
87-5	Svennbukt	1835 IV	56.0-03.2	4-12	0.58	3.0	Irreg. diss. (1 km2) of ITO in gabbro and hornbl. Total ITO: 9-50 % (Geis 1968).
88-5	Sørfjordelv	1835 IV	56.8-03.1				Similar to Svennbukt (Geis 1968).
89-5	Storlien	1835 IV	56.9-02.6				Similar to Svennbukt (Geis 1968).
90-5	Gamvann	1835 IV	57.1-00.7				Diss. of ITO in carbonatite (Geis 1968).
91-5	Fjellfinndal	1835 IV	58.5-01.1	16	0.16	9.1	Irreg. diss. (350000 m2) and minor massive lenses of ITO in hornbl. pyroxenite (Geis 1968, Robins 1985).
92-5	Talvik, Ytre	1835 IV	62.2-96.1	4.4	0.43	2,0	Irreg. diss. of ITO and beach sand (Geis 1968).
				5.4	0.45	2.5	Beach sand.
93-5	Sommerset	1835 IV	63.4-95.5				Irreg. diss. of ITO (150000 m2) in hornbl. (Geis 1968).
94-5	Simaviknes	1835 IV	65.3-95.7				Diss. of ITO (35000 m2) in hornbl. (Geis 1968).
95-5	Rognsund	1835 I	73.0-99.6	< 7	0.54	1.5	Irreg. diss. of ITO (375000 m2) in olivine gabbro Total ITO: 6 % (Geis 1968).
96-5	Mageluft	1835 I	72.0-02.6	< 7			Irreg. diss. of ITO (450000 m2) in olivine gabbro Total ITO: 4 % (Geis 1968).
97-5	Skarveberget	1835 I	77.8-02.4	4.6	0.07	4.0	Minor ore-body of ITO in alkali syenite pegm. (Geis 1968, Robins 1985).
98-5	Melkedalsvann	1835 I	83.6-00.8				No data.
99-5	Eidelborg	1835 I	90.5-98.8				Low grade ITO (Robins 1985).
	Hasvik	1836 III					Low grade ITO (Robins 1985).

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THE LOFOTEN-VESTERÅLEN REGION							
Titaniferous magnetite/ilmenite deposits are associated with Proterozoic (approx. 1900 Ma.) gabbroic to anorthositic rocks.							
14-4	Holdøy	1131 I	95.6-93.9				No data.
37-4	Napp	1031 II	35.3-59.8				No data.
			35.8-59.8				
70-4	Frivåg	1132 I	98.9-45.6				Minor lenses of ITO in gabbro (Poulsen 1936, Geis 1968).
71-4	Tilset	1132 I	99.5-41.8				No data.
72-4	Øksnesheia	1132 I	99.0-42.1	1-2	0.15	0.5	Minor diss. of ITO in matagabbro (Poulsen 1936, Geis 1968).
73-4	Hjellsand	1132 I	96.2-42.3	4-6	0.40	2.6	Minor diss. of ITO in gabbro (Carstens 1941).
74-4	Bergseng	1132 I	93.7-35.7				Minor lenses of ITO in gabbro (Poulsen 1936).
75-4	Austringen	1132 I	93.7-33.6	6.7	0.28	2.9	Irreg. diss. and massive lenses of ITO in gabbro (Carstens 1941, Geis 1968).
			94.1-33.6				
76-4	Klubbskjæret	1132 I	97.1-32.1		0.28	3.0	Minor conc. of ITO in sheared gabbro (Poulsen 1936).
78-4	Finberget	1132 I	99.0-29.5				Minor; in gabbro (Poulsen 1936).
79-4	Dungan	1132 I	97.9-29.9				Minor lenses of massive ore of ITO in gabbro (Geis 1968).
80-4	Dyrøy	1132 I	91.7-34.2		0.35	4.7	Diss. and massive lenses of ITO in layered gabbro (Carstens 1941).
81-4	Vinje	1132 I	90.6-34.5				Diss. of ITO in gabbro (Poulsen 1936).
			91.0-34.4				
82-4	Djupeidet	1132 I	90.8-35.6				Minor lenses of ITO (Poulsen 1936).
83-4	Tinden	1132 I	90.3-37.5				Minor diss. of ITO in gabbro (Geis 1968, Poulsen 1936).
84-4	Sunnan	1132 I	87.0-35.6				Similar to Tinden.
			87.6-35.4				
			89.0-35.3				
85-4	Reinsdigelen	1132 I	86.7-33.4				Minor lenses of ITO (Poulsen 1936).
86-4	Godvik	1132 I	85.3-33.6				Minor diss. in layeres of ITO (Geis 1968).
87-4	Utskår	1132 I	86.6-32.9				No data.
88-4	Selvåg	1132 I	82.8-29.2		0.40	5.0	Fairly massive ore of ITO in a layered gabbro-complex. Ore reserves: 44 million tons. (Priesemann and Krause 1985). Additional minor beach sand occurrences of ITO at Hovden.

Ref. no.(*)	Name of deposit	Map sheet (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt.	% TiO2 conc.	Comments (**)
89-4	Gustad	1132 II	81.0-26.5	2.5	0.30	2.9	Fairly massiv ore of ITO in layered gabbro. The ore is a continuation of Lower Ore Horizon in the Eidet-Hovden intrusion (Priesemann & Krause 1985).
91-4	Åsan	1132 II	78.9-24.2				Minor conc. of ITO in gabbro (Poulsen 1936).
92-4	Vindhammeren	1132 II	90.7-18.9				No data.
112-4	Sløverfjord	1131 I	95.7-91.0 96.1-89.0 97.6-88.2				No data.
113-4	Fiskebøl	1131 I	92.3-91.4 93.1-92.0	6.4	0.06	5.6	Diss. of ITO (Geis 1968).
117-4	Valen	1231 IV	01.0-77.2				No data.
128-4	Vatnefjord	1131 I	77.2-80.9				Rutile in granite.
130-4	Kudalen	1131 I	82.5-76.8 83.0-76.6	4.2	0.10	0.8	Irreg. diss. and massive lenses of ITO. 1% P in crude ore (Carstens 1941).
140-4	Andopen	1031 II	33.7-55.5		0.40	3.0	Minor conc. of ITO in anorth. (C.W. Carstens 1941, H. Carstens 1957).
141-4	Nusfjord	1031 II	30.4-47.2				Similar to Andopen (C.W. Carstens 1941, H. Carstens 1957).
142-4	Kvalvik	1031 III	19.8-52.6 20.3-52.7	7	0.24	1.9	Beach sand of ITO (from weathering of gabbro (Carstens 1941, Geis 1968).

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THE MØRE REGION							
Fe-Ti deposits in the Møre province are generally associated with strongly-deformed amphibolites, metagabbros and dolerites in Proterozoic gneisses (approx. 1700 Ma.). One deposit (Fiskå) occurs in an anorthosite massif.							
3-3	Norvik	1320 III	20.2-40.6				No data.
31-3	Fiskå	1119 III	20.6-91.0		0.46	3.2	Minor irreg. conc. of ITO in anorth. (Carstens 1941).
32-3	Brandal	1119 III	21.1-97.6				No data.
33-3	Seljeset	1119 III	29.0-03.7				Minor diss. of ITO (Geis 1968).
34-3	Berge	1119 IV	27.0-16.4		0.60	1.9	Minor lenses and layers of ITO in eclogite (Gjelsvik 1957).
35-3	Hustadneset	1219 III	69.7-99.6				Minor conc. of ilm. and apatite in a garnet-peridotite (Carstens 1957 a).
36-3	Søkelv	1219 IV	76.4-09.1				No data.
37-3	Tafjord	1319 III	17.2-01.2		0.38	1.1	Irreg. conc. of ITO in sheared amph. (Carstens 1957 a).
38-3	Kammen	1319 III	18.4-01.2				Minor conc. of ITO in amph. (Geis 1968).
39-3	Øyen	1319 III	19.7-98.3		0.40	1.4	Diss. of ITO in gabbro (Gjelsvik 1957, Carstens 1957 a).
40-3	Rødal	1319 III	21.6-96.7		0.07	14.6	Minor conc. of ITO in gabbro (Gjelsvik 1957).
41-3	Hanedalstind	1319 I	37.5-12.0				Minor (Vogt 1910).
43-3	Sjøholt	1219 I	86.5-30.6	12	0.48	5.1	Lenses of ITO in amph. The deposit probably contains a few million tons of ore (Heltzen 1948, Geis 1968).
44-3	Solnørdal	1219 I	85.2-30.9	12-14	0.48	2.8	Rich diss. of ITO in amph. Estim. ressources: 6 million tons of ore (Heltzen 1948, Geis 1968).
45-3	Vågseternes (*)	1320 III	18.4-53.4	4-5	0.58	0.4	Diss. of ITO in amph. (Geis 1965, 1968)
	Horja (*)	1320 III			0.64		Eastwards from Vågseternes; minor lenses of ITO over 4 km length in amph. (Geis 1965, 1968).
46-3	Strømme	1320 III	24.3-4.09	11	0.50	0.6	Minor conc. of ITO in gabbro (Geis 1968)
57-3	Oppdøl (*)	1420 III	75.1-5.73		0.44	0.9	Diss. of ITO in amph. (Carstens 1941, Geis 1968).
59-3	Meisingset (*)	1420 IV	63.9-70.4	2-6	0.53	0.8	Similar to Rødsand. Resources: 10+ million tons (Carstens 1946; Geis 1968).

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60-3	Klingerskard.(*)	1320 I	59.2-69.8				Diss. of ITO in amph. (Geis 1965, 1968).
61-3	Rødsand (*)	1320 I	55.4-68.7	4	0.51	2.0	Rich diss. of ITO in amph. (Geis 1965, 1968; Sanetra 1985).
62-3	Heimdal (*)	1320 I	48.3-62.8 49.0-62.9	3-6	0.54	1.0	Approx. 5 million tons crude ore (Geis 1965, 1968).
63-3	Rødseter (*)	1320 I	45.6-64.2	3-6	0.40	0.2	Similar to Rødsand (Geis 1965, 1968).
64-3	Gusjås (*)	1320 I	41.4-65.9	5	0.61	1.0	Similar to Rødsand (Geis 1965, 1968).
	Mittet				0.58	2.5	Diss. of ITO in gabbro (Geis 1968).
66-3	Vistdalen	1320 II	44.7-55.5				Minor conc. of ITO in gabbro (Geis 1968).
76-3	Bårset	1421 III	63.8-98.2	9	0.45	10.9	Minor lenses of ITO in gabbro (Carstens 1941).
78-3	Bæverfjord (*)	1421 III	80.0-89.1 80.6-89.6	5-6	0.50	0.9	Similar to Rødsand (Carstens 1941, Geis 1968)
130-3	Veblungsnes	1320 III	31.5-30.4				No data.
131-3	Bersås	1320 I	55.0-65.0				No data.
196-3	Muldal	1319 IV	18.7-03.8				No data.

(*) Rødsand type

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THE SUNNFJORD REGION							
Titaniferous magnetite/ilmenite deposits are associated with Proterozoic (approx. 1700 Ma.) metagabbros, while rutile deposits occur within Caledonian eclogites (see Korneliussen & Foslie 1985).							
2-2	Sellevoll	1117 I	90.7-98.5	8-13			Minor lenses of ITO in garnet-amph. (Geis 1968, Korneliussen 1980)
3-2	Loneheia	1117 I	93.5-01.5				Minor conc. of ITO in garnet-amph. (Stadheim, undated b).
4-2	Sørdalen	1117 I	97.4-01.6		0.54	1.4	Irreg. diss. and massive lenses of ITO in partly retrograded eclogite (Stadheim, undated b; Geis 1968, Korneliussen 1980).
5-2	Gjølanger	1117 I	97.8-03.6		0.39		Irreg. diss. of ITO in garnet-amph. and eclogite, partly along chloritized zones (Geis 1968, Korneliussen 1980).
6-2	Flekke	1117 I	15.5-03.5	0.3	0.04	0.7	Irreg. diss. of ITO in a chlorite chist and within relicts of garnet-amph. and eclogite (Geis 1968, Korneliussen 1980).
12-2	Blåfjell	1117 II	08.3-86.5				Minor ITO in gabbro (Geis 1968).
15-2	Løland	1117 II	05.5-86.2	8-10	0.36	2.0	Minor conc. of ITO in gabbro (Geis 1968, Korneliussen 1980).
17-2	Folkestad	1117 IV	88.7-97.7	8-13			Minor conc. of hemo-ilm. in amph. (Stadheim, undated b; Geis 1968, Korneliussen 1980)
18-2	Råsberg	1217 III	16.2-83.7	1-4			Diss. of ITO in gabbro (Geis 1968, Korneliussen 1980).
19-2	Mølmesdal	1217 III	13.3-83.8	2-3			Low-grade diss. of ITO in gabbro (Geis 1968, Korneliussen 1980).
19-2	Båsdal	1217 III	13.0-83.8	4.0			Minor conc. of ITO in gabbro (Geis 1968, Korneliussen 1980).
	Naustdal	1218 III	26,0-24.9	3-4			Low-grade rutile in eclogites (Korneliussen & Foslie 1985).
	Engebøfjellet	1117 I	10.0-23.0	3-4			As for Naustdal.
	Fureviknipa	1217 IV	26.7-19.2	3-4			As for Naustdal.
	Solvik	1117 I	97.5-03.8	3-4			As for Naustdal.

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THE BERGEN REGION							
Deposits with titaniferous magnetite/ilmenite or hemo-ilmenite are associated with Proterozoic (approx. 1700 Ma. ?) metamorphosed gabbroic to anorthositic rocks.							
74-2	Lindås	1116 II	91.8-40.8				No data.
305-2	Myntevik	1115 I	91.4-87.5				No data.
306-2	Gymmeland	1115 I	04.1-90.5	3.8			Lenses of ITO (Carstens 1941, Haber 1941).
309-2	Espeland	1215 IV	06.0-00.3	14	0.44	1.7	Minor lenses of ITO in amph. (Geis 1968).
310-2	Arna	1215 IV	06.1-05.6				Minor lenses of ITO in anorth. (Smith 1912, Geis 1968).
313-2	Mykeliskar	1215 IV	09.2-10.9				No data.
324-2	Alversund	1116 II	91.6-22.6	6-32		1.6	Minor lenses of massive hemo-ilm. in anorth. (Geis 1968). Associated deposits: Soltveit and Remme
325-2	Tveitøy	1116 II	92.9-23.0				Minor diss. and lenses of ITO.
326-2	Lyseknappen	1116 II	89.8-28.5				Minor lenses of ilmenite.
327-2	Askeland	1116 II	88.6-29.6				Diss. and bands of ITO in metagabbro (Haber 1940).
328-2	Kidholmen	1116 III	83.6-28.9				No data.
329-2	Seilfald	1116 III	82.3-29.3				Minor lenses of hemo-ilm. (Haber 1940).
330-2	Skjortanipa	1115 I	04.6-07.0				No data.
	Kjeset						Minor ITO in garnet-amph. (Geis 1968).
	Askøy						Very small lenses of ITO (Haber 1940).

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THE SOUTH-ROGALAND IGNEOUS COMPLEX							
Ti-Fe deposits and mineralizations connected with the intrusive rocks - anorthosite (massif-type), norite (banded and partly strongly differentiated) and mangerite. Main minerals are ilmenite, magnetite and sulfides. The only operating titanium mine in Norway at present, is within the ilmenite norite ore-body at Tellnes (Krause et al. 1985).							
374-2	Bakka	1311 IV	43.42-73.76	12-14			For Bakka to Drageland:
182-2	Bø Utmark	"	42.42-70.64	14-15			Massive and diss. bands of ITO
	Prestbro	"	42.85-70.35	9-12			in norite (accessory sulfides).
181-2	Årstad gruve	"	42.80-69.22	17-22			
184-2	Årstadøy	"	41.33-69.18	14-15			
182-2	Hauge gruve	"	41.20-70.22	22-26			
	Drageland	"	40.52-70.94	13-16			
179-2	Storgangen	1311 IV	44.00-72.15	10-45			For Storgangen to Kjørfjell:
	Åmodt gruve	"	43.62-71.81	19-38			In operation from 1916 to 1965.
	Brekke gruve	"	45.82-72.62	28-30			Massive and banded ilmenite-norite.
	Sidegangen 1	"	44.33-72.51	21-27			Ore reserves: 60 million tons (Average 19% TiO2)
	Sidegangen 2	"	44.80-72.65	21-27			
	Sidegangen 3	"	45.34-72.56	21-27			
	Sidegangens (2) fortsettelse	"	45.00-73.27	16-20			
	Aursland skjerp	"	46.41-72.00	18-28			
	Kjørfjell	"	45.05-73.70				
177-2	Blåfjell mines						For Blåfjell to Blåfjelldal:
	Topgruve	1311 IV	47.08-71.65	40-45			In operation from 1863 to 1876.
	Overgruve	"	47.14-71.75	40-45			Massive, coarse-grained ilmenite.
	Undergruve	"	47.13-71.76	40-45			
	Platformgruve	"	47.09-71.77	40-45			
	Aursland 1 gr.	"	47.20-71.79	40-45			
	Ligruve	"	47.02-71.73	40-45			
	Rasetgruve	"	46.92-71.72	40-45			
	Nye Rasetgruve	"	46.87-71.76	40-45			
	Blåfjelldal	"	47.13-71.61	40-45			

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							For Blåfjellskaret to Hilleråsen:
	Blåfjellskaret	"	45.65-73.62	43			Norite dykes, in places rich in ITO,
	Frøytlog	"	45.67-73.62	43			or ilmenite-rich bands belonging to the
	Store Ålgård	"	45.06-75.88	38-43			Bøstølen banded intrusion and the norite-
	Florkleiv	"	44.78-76.16	38-43			pegmatite body at Blåfjell-Laksedal
	Brombo	"	50.27-73.23	33-41			(see Fig.1 in Krause et al. 1985).
174-2	Raunsli skjerp	"	47.66-66.04	38-39			
	Sletthei skjerp	"	46.64-68.59	16-25			
	Laksedal	"	46.54-69.10	28-35			
	Dalens gang	"	47.00-68.99	36-45			
	Bryns skjerp	"	46.94-69.34	17-40			
	Dalestøa skjerp	"	54.88-65.23				
	Skolla skjerp	"	54.86-63.57	9-10			
	Kvanvikåsen	"	55.14-63.14				
	Grasjenåsen	"	54.58-63.03				
	Vardåsen	"	54.40-62.44	38-43			
	Hilleråsen	"	54.59-62.34				
371-2	Tellnes	"	48.50-69.80	15-23	0.42	44.8	Average 18% TiO2. Open-pit mining in ilmenite-norite since 1960. Reserves: 300 million tons. The vanadium analyses is based on microprobe analyses of magnetite (Krause et al. 1985).
426-2	Vaksviken skj.	1211 I	22.40-79.95				
427-2	Regevik skjerp	"	24.05-80.00				For Vaksvik skjerp to Pramstø:
428-2	Hestnes skjerp	"	25.05-80.15				Massive or diss. ITO belonging to the
429-2	Tysslandsvad	"	27.70-80.10				"Norite-granitic zone" of P.Michot (1960)
	Rødemyr gruve	"	28.54-79.99				See Krause et al. (1985).
430-2	Fisketjern gr.	"	28.53-79.98				
	Berkjedalen	"	28.98-80.02	18-20			
	Thorsdalen gr.	"	29.35-80.08	18-20			
	Skåra gruve	"	29.58-80.09				
	Raaes gruve	"	29.57-80.17				
	Kaknuten gruve	"	29.72-80.16				
	Bredeskaret	"	30.30-80.17				
	Sørskaret	"	30.61-80.20				
	Omdalsskaret	"	30.87-80.21				
	Vallbakken	"	30.96-80.19				
	Langemyr nr. 15	"	31.26-80.06				
	Karen gruve	"	31.32-80.03				

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	Knuts gruve	"	31.58-80.00				
	Lyngnes gruve	"	32.17-79.87				
	Lundetangen	"	32.24-79.86				
	Peder Anker	"	32.28-79.86				
	Ankershus	"	32.34-79.83				
	Egebakkskaret(W)	"	32.53-79.78				
	Egebakkskaret(E)	"	32.54-79.78				
	Lielven gruve 1	"	32.75-79.71				
	Lielven gruve 2	"	32.79-79.71				
	Furufjellet 1	"	32.97-79.69				
	Furufjellet 2	"	33.21-79.68				
	Jentofts gruve	"	33.23-79.73				
	Sandknuten (W)	"	33.41-79.72				
	Sandknuten (E)	"	33.57-79.69				
	Snørringdalen gr	"	34.92-78.58				
432-2	Pramknuten 1	"	35.02-78.15				
	Pramknuten 2	"	35.01-78.06				
	Pramknuten 3	"	34.95-78.00				
	Pramknuten 4	"	35.02-77.88				
	Pramstø	"	34.98-77.71				
433-2	Horstigheien	"	27.22-76.20				Norite dyke, rich in ITO.
431-2	Vatland	"	34.66-71.12	39-40			As Horstigheien.
122-2	Tosås	1311 II	71.7-52.0	16	0.46	5.1	Minor lenses of ITO in anorth. (Carstens 1941).
123-2	Skrånefjell	"	71.3-57.3				
356-2	Grødheim	"	30.6-76.1				
361-2	Åse	"	27.0-78.9				
362-2	Rotveit	"	33.3-74.5				
367-2	Øvre Veisdal	1311 II	58.8-56.2				
368-2	Saksenskjær	"	59.4-53.7				
369-2	Tinnbakkneset	1311 III	57.5-55.6				
373-2	Ørsland	"	43.0-74.6				
374-2	Bakka	"	42.9-73.6				
376-2	Sokndal	"	41.6-71.4				
398-2	Langeli	1312 III	38.7-88.5				
403-2	Vasshus	1312 III	46.3-91.2				Rutile
431-2	Vasshus	"	46.2-91.1				
492-2	Klubben	1311 I	60.0-80.7				
56-2	R øydland	1312 III	38.7-89 .4 39.2-89.6				

Ref. no.(*)	Name of deposit	Map sheet (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt. conc.	% TiO2	Comments (**)
THE BAMBLE PROVINCE							
Deposits of disseminated vanadium-rich magnetite and ilmenite are found as bands and lenses in amphibolites within Proterozoic (approx. 1700 Ma.) metasediments and gneisses. The host amphibolites have been intruded as basic sills that have intruded concordantly to quartzites and gneisses. Primary features are obscured by tectonometamorphic events. Some of the mineralization has a stratiform appearance (Aggerholm 1979). A few deposits are associated with rocks of gabbroic textures. Minor deposits with irregular disseminations of rutile occur within albitites and pegmatites (approx. 1000 Ma.).							
560-1	Langøy	1712 IV	28.1-28.9 28.5-29.9 28.5-29.3 28.8-30.2 29.0-30.5 29.0-29.8 29.5-30.2 30.3-30.5 31.1-30.5 31.4-30.3	10-16	0.80	7.3	ITO in gabbro (Geis 1968).
561-1	Gomøy	1712 IV	28.0-26.8 28.1-27.8 28.6-27.8 30.2-28.1	7-16	0.57	10.5	ITO in gabbro (Geis 1968).
565-1	Skredderhagen	1712 IV	18.2-28.7	16	0.76	2.3	ITO (Carstens 1941).
566-1	Tyvann	1712 IV	17.7-31.0				ITO (Stadheim 1936 a).
567-1	Torsdal	1712 IV	16.7-26.8 17.2-27.4				ITO (Geis 1968).
568-1	Lien	1712 IV	17.0-25.5				No data.
569-1	Dypsundholmen	1712 IV	18.7-23.9				Rutile in albitite.
571-1	Smørvik	1712 IV	17.2-24.2				No data.
572-1	Ødefjell	1612 I	11.8-21.7				No data.
573-1	Dobbe	1712 IV	14.5-19.0	17	1.0	2.4	ITO in amph. (Geis 1968, Aggerholm 1969).

Ref. no.(*)	Name of deposit	Map sheet (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt.	% TiO2 conc.	Comments (**)
574-1	Saga	1712 IV	13.0-18.6		0.9	2.0	ITO in amph. (Stadheim 1936 a, Aggerholm 1979).
575-1	Brekka	1712 IV	14.6-19.0	20	0.9	1.5	ITO in amph. (Stadheim 1936 a, Geis 1968).
	Fosstvedt			16	0.6	14.8	ITO in amph. (Geis 1968).
577-1	Landsverk	1712 IV	20.7-32.2				Rutile in albitite.
580-1	Frydenborg	1712 IV	23.6-26.0				Rutile in albitite.
581-1	Haukedal	1712 IV	22.7-25.2				Rutile in albitite.
582-1	Lindvigkollen	1712 IV	21.2-25.4				Rutile in albitite.
868-1	Svartegruben	1612 I	08.2-21.2	16	0.8	6.7	ITO in amph. (Carstens 1941, Geis 1968).
869-1	Eikeland	1612 I					No data.
870-1	Ståltjern	1612 I	07.6-19.4	15	0.8	5.0	ITO in amph. (Carstens 1941, Geis 1968, Aggerholm 1979).
872-1	Myrestø	1612 I	11.8-21.7	15	0.8	4.1	ITO in amph. (Carstens 1941).
874-1	Grytingen	1612 I	02.6-22.0	20	0.4	10.7	ITO in amph. (Geis 1968).
881-1	Barmen, Øya	1612 II	07.7-11.0	16	0.6	4.0	ITO in amph. (Carstens 1941, Aggerholm 1979).
			08.6-10.6				
			09.2-10.5				
903-1	Selås	1612 III	86.0-05.6				ITO in amph.
904-1	Bortjerndalen	1612 III	90.3-06.9				ITO in amph.
			90.8-05.5				
924-1	Flaten	1612 III	81.4-00.8				ITO in amph.
			81.8-99.5				
			82.4-00.2				
898-1	Verland	1612 II	95.5-08.4				Rutile in pegm.
897-1	Sandtjern	1612 II	91.6-06.5				Rutile in pegm.
895-1	Laget	1612 II	04.5-04.7				Rutile in pegm.
875-1	Fone	1612 I	04.1-23.5				Rutile in pegm.
876-1	Stormyr	1612 I	01.9-21.1				Rutile in pegm.
879-1	Simonstad	1612 I	97.9-14.8				Rutile in pegm.
			98.7-14.7				

OCCURRENCES OUTSIDE THE MAIN TI/FE-TI ORE-PROVINCES

Ref. no.(*)	Kommune	Name of deposit	Map (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt.-conc.	% TiO2.	Comments (**)
FINNMARK								
107-5	Alta	Kjerringhaugen	1835 II	90.2-79.9	7	0.49	10.4	Diss. of ITO in greenstone (1500 m2). Total ITO: 27 % (Geis 1968).
122-5	Alta	Tappeluft	1835 III	56.2-75.7	<15	0.35	4-6	Small lenses of diss. to massive ores of ITO in gabbro (Geis 1968).
123-5	Alta	Myren	1835 III	57.8-75.5				No data.
TROMS								
250-5	Karlsøy	Solvannet	1534 I	37.0-57.1				No data.
251-5	Karlsøy	Soltinnbruna	1534 I	35.8-58.4				No data.
299-5	Målelv	Markusseter	1533 III	20.7-70.6				No data.
300-5	Målselv	Langhaugen	1533 III	08.1-59.1				No data.
308-5	Balsfjord	Takvann	1533 III	21.3-70.7	13-18	0.28		Massiv ore of ITO (2 m thick; Geis 1968).
324-5	Tromsø	Rekvik	1434 II	97.1-38.8				Rutile.
417-5	Balsfjord	Hattavarre	1533 II	39.6-66.3	12	0.32	2.3	Lenses of diss. and massive ore in amph. (1.5 million tons; Geis 1968).
451-5	Bardu	Leinavatn	1531 I	49.7-91.0				No data.
			1631 IV	53.6-92.0				
			"	56.4-93.2				
TRØNDELAG								
430-3	Åfjord	Finvold(Dopma)	1623 II	86.1-11.3	7-12	0.43	14.0	ITO in gabbro (Carstens 1957 a).
517-3	Flatanger	Glasøy	1623 I	85.8-52.7	9.5	0.56	2.0	ITO in strongly deformed gabbro (Johansen 1942, Geis 1968).

Ref. no.(*)	Kommune	Name of deposit	Map (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt.-conc.	% TiO2. in Mt.-conc.	Comments (**)
OPPLAND								
955-1	Lesja	Lesja	1419 III	71.2-99.4 71.5-99.4 71.3-99.9 71.6-99.7		0.35	2.0	Minor ores of ITO in amph.
956-3	Lesja	Fjell	1419 III	71.6-01.3				Similar to Lesja.
SOGN OG FJORDANE								
21-2	Balestrand	Lindane	1317 III	60.1-78.7	6.3			Massive and diss. ITO.
27-2	Leikanger	Frøningen	1417 III	00.8-77.0	6.6			Minor lenses of ITO in gabbro (Geis 1968).
HORDALAND								
252-2	Kvinnherad	Baugstø	1214 I	30.4-29.8 30.9-29.9	15,2	0.44	10.6	Lenses of ITO in gabbro (Geis 1968).
337-2	Etne	Prestefjell	1214 II	29.6-26.4				
ROGALAND								
213-2	Hjelmeland	Daletødne	1313 IV	51.5-79.1	5.2	0.19	2.7	Lenses of ITO (C.W. Carstens 1941, H. Carstens 1957 a).
76-2	Tysvær	Hetland	1113I	97.8-82.3 30.0-26.0				No data.
VEST-AGDER								
393-2	Kristiansand	Buen	1511 II	50.4-56.1				No data.
TELEMARK								
510-1	Drangeland	Homli	1613 III	88.2-67.7				No data.
514-1	Drangeland	Loner	1613 III	88.1-62.2	<15	0.5	2-6	Irreg. diss. of ITO in gabbro (Geis 1968).
537-1	Porsgrunn	Røra	1713 III	31.1-54.7	4-16	1.5	2.5	Irreg. diss. of ITO in amph. (Geis 1968).
539-1	Bamble	Herre	1713 III	32.8-51.4		0.76	11.5	Lenses of ITO in gabbro (Carstens 1941)

Ref. no.(*)	Kommune	Name of deposit	Map (1:50000)	Co-ord. (UTM)(#)	% TiO2 in ore	% V in Mt.-conc.	% TiO2.	Comments (**)
BUSKERUD								
323-1	Øvre Eiker	Spissholt	1714 II	42.0-14.2	9.3	0.08	4.7	Minor lenses of ITO in apatite bearing gabbro (Carstens 1941, Geis 1968)
725-1	Modum	Dybingdal	1715 II	46.9-58.6 48.9-59.0				No data.
782-1	Modum	Grautåsen	1715 II	50.0-61.0				No data.
HEDMARK								
41-1	Eidskog	Trandum	2014 I	39.3-47.1 39.8-46.0 41.0-46.5 41.7-44.9	6-10	0.25	11.0	Minor lenses of ITO in gabbro (Geis 1968).
52-1	Kongsvinger	Ramsøy	2015 I	34.7-94.3	9	0.29	8.0	Massive lenses of ITO in gabbro (Foslie 1913, Geis 1968)
VESTFOLD								
534-1	Andebu	Kodal	1813 III	59.6-66.0(a) 60.1-67.0	6.8	0.11		A large apatite-magnetite-ilmenite clinopyroxenite dyke in larvikite and monzonite. Ore reserves: 70 million tons (3% P; Lindberg 1985).
AKERSHUS								
29-1	Vestby	Filtvedt	1814 II	95.1-07.0				No data.
32-1	Oppegård	Sjødal	1914 IV	97.8-26.8	12			Lenses of ITO in gabbro.
ØSTFOLD								
3-1	Aremark	Grubemyr	2013 III	56.3-54.4				No data.
4-1	Aremark	Holmegildfj.	2013 III	53.2-54.6				No data.
19-1	Eidskog	Vikeby	2014 III	45.0-06.4				Diss. of ITO in gabbro (Stadheim 1938).

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(*) Reference no. NGU-Bergarkivet,
Norges Geologiske Undersøkelse.
Based on Foslie (1925) and Poulsen (1964).

(**) Ilm. : Ilmenite
Mt. : Magnetite
Hemo-ilm. : Hematite/ilmenite intergrowth
Anorth. : Anorthosite
Amph. : Amphibolite
Conc. : Concentration(s)
Irreg. : Irregular
Diss. : Dissemination(s)
Hornbl. : Hornblendite
ITO : Iron-titanium oxides
Pegm. : Pegmatite

(#) Universal Transverse Mercator Grid.
Locally co-ordinates are based on location maps in
Bergarkivet, NGU.

Additional information is available from Bergarkivet,
Norges Geologiske Undersøkelse.

This suppelement, which is based on data from NGU,
Elkem A/S, Norsk Hydro A/S as well as the authors
own observations in the field, will be subject to revisions.
Please send corrections and additional information to the NGU
Section for ore geology.