Bergvesenet

Postboks 3021, 7002 Trondheim

Rapportarkivet

Bergvesenet rapport nr	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
BV 3534			Trondheim	
Kommer fra ..arkiv Næringsdepartementet	Ekstern rapport nr	Oversendt fra	Fortrolig pga	Fortrolig fra dato:

Tittel

The Fen Deposit as a raw material source for rare earths.

Forfatter	Dato	Bedrift
	1983	Megon A/S

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Nome	Telemark	Østlandske		

Fagområde	Dokument type	Forekomster
		Fen-Feltet
Råstofftype	Emneord	
Malm/metall	Sjeldne jordarter	

Sammendrag

OV3334

En oversikt utarbeidet 1983 for våre utenlandske forbindelser bl.a. Mitsubishi Chemical Industries og Johnson Matthey.

THE FEN DEPOSIT AS A RAW MATERIAL SOURCE FOR RARE EARTHS.

Synopsis

The Fen deposit of rare earths has remained in focus for our research since 1967. It was in fact one of the basic premises on which Megon was founded.

However, due to the extremely complex composition of the ore it has not until the present year been possible to extract the valuable components from this very large resource.

The rare earths in Fen represent a unique combination of europium and yttrium content. In addition the ore contains niobium with very low tantalum and even scandium is found in exceptional high concentration.

Elkem's R & D Center has now tested in the laboratory a patentable concept in three alternatives whereby the valuable rare earths are extracted selectively.

Description

The deposit has been known for several hundred years. For 300 years it was used as an iron ore mine, but abandoned as such in 1928.

After World War II, Fen was developed by the Norwegian government to become a niobium mine and it was in operation as such for about 20 years. When prices for niobium fell drastically after the discovery of similar deposits of niobium in Canada and in Brazil also this operation was abandoned.

./. The enclosed map "Tegning nr. 820-01, Fensfeltet Ulefoss", by Norges geologiske Undersøkelse, dated Aug./Jan. 1968 and the
./. enclosed article "The Fen Circular Complex" by T.F.W. Barth and J. B. Ramberg, dated 1966 give together a comprehensive description of this indeed complex deposit.

Megon's owners have been engaged in research of the Fen area since 1967, with particular emphasis on the eastern most part, "Gruveåsen" where the concentration of rare earths content reaches a maximum.

Still, even this limited portion of the complex shows a very complicated structure. Recently our work has been concentrated around one particular rock in this area, called "rødberg", which means red rock. On the other hand this is the dominant massive rock in the Gruveåsen and there are many million tons of it exposed with hardly any overburden at all.

Rødberg is being characterized as a magmatic calcium-magnesium rich carbonatite impregnated with hematite. The mineralogical composition is roughly as follows:

3,9	% silicates
54	" calcite
26	" hematite
8	" dolomite
1,5	" apatite
3	" RE minerals
3,5	" various minerals

The exact composition of the two latter species has not been identified with scientific certainty and this matter is still being discussed.

The rare earth minerals apparently are predominantly monazite, bastnäsite, parisite and synchisite. Among the "various minerals" seem to be thorite, koppite, and columbite particularly low in tantalum. The rock is radioactive, however, not to the same extent as monazite.

Rødberg from Fen has an exceptional distribution of rare earths as is shown in the accompanying two tabulations. It contains up to 20 times more europium than bastnäsite in percent of total rare earths. In addition it contains as much yttrium as monazite and even a substantial content of scandium, besides as mentioned niobium.

It is thus a most particular resource. Unfortunately all the valuable components are disseminated throughout the rock in an extremely fine grained, submicroscopic form, which not even microprobe analysis methods have been able to show in detail.

Hydrometallurgical extraction

Even the most intense efforts at upgrading the rock in respect of rare earths have all been in vain.

However, this year Megon has succeeded in developing three alternative chemical extraction concepts, which all three suppress the dissolution of calcium and iron while enhancing the dissolution of rare earths, yttrium and scandium. Two of these methods are subject to patent applications.

Several economical calculations have been carried out showing acceptable net cash flow discounted on an estimated investment of between kr 100-200 mill. depending upon the scale of operation chosen. These figures include kr 25 mill. estimated for development costs.

If 50.000 tons per year is chosen as basis the output of Eu_2O_3 would be 2.500 kg per year. If 150.000 tons per year is chosen the output would be 7.000 kg Eu_2O_3. Furthermore the plants would also produce 18 tons respectively 54 tons of Y_2O_3 per year.

It is of course realized that such large new capacity of europium and yttrium may have a severe impact on the world market. The prices used in the calculations have therefore been chosen at half of today's market prices.

During 1983 and the first quarter of 1984 the laboratory tests of the proposed principles will be continued. Megon intends to engage Elkem R & D Center then to build a pilot plant at Fiskaa where 5-10 kg rødberg per hour can be prosessed. Most of the equipment is already available from earlier pilot operations with Y_2O_3 and with complex copper ores.

It is assumed that 18 months operation should suffice for testing out the process on this scale. The data collected will be used when engineering a full scale industrial plant. The pilot operation will also provide experience for tackling environmental problems to be expected.

Already at such a small scale the pilot plant may be expected to produce some interesting quantities of scandium oxide, which may fetch a growing market.

Ownership and rights.

The company S. D. Cappelen which is one of the shareholders of A/S Megon is the owner of the property at Gruveåsen and the company has also exclusive title to the mining rights in this area. These mining rights have been temporarily leased to the limited partnership K/S A/S Fenco.

Fenco was formed in 1980 by four of Megon's shareholders and entered into a joint venture with A/S Union Minerals Norge with the purpose of exploration and exploitation of metallic and mineral deposits in the Fen area.

It is however being realized that if the deposit should become fully developed by Megon beyond the laboratory stage in which it is now engaged, this would significantly alter the profile of Megon itself.

Godkj. Norsk 20 3.6.69

ULEFOSS

NORSJØ

HOLLA

HYDROGANGEN

SØVE GRUVER

Dbh.C.11

Dbh. C.43

TORSNES

SØVE

TUFTESTOLLEN

Tuftehaugen

150 m

200 m

350 m

FENSGRUVENE

Prøvetunnelen

GRUVEÅSEN

TYSKLAND

T.18 T.16 T.21 T.23

T.9 T.11 T.8 T.13 T.12 T.14

TUFTE

KÅSA

HOLLA

FEN

RAUHAUG

VIPETO

HÅTVET

RIKSVEG - SKIEN

MELTEIG

Håtvet-tj.

Damtjern

TEGNFORKLARING

- Gneis
- Fenitt
- Basiske silikatbergarter
- Damtjernitt
- Søvitt
- Rauhaugitt
- Rødberg

③ Prøvepunkt med nr.

Mutingspunkter:

× i dagen, ■ under jord } Cappelen

⁂ i dagen, ⁂ under jord } Norsk Bergverk

Jernforekomster

GEOLOGISK KART MED PRØVEPUNKTER OG MUTINGSPUNKTER FENSFELTET, ULEFOSS	MÅLESTOKK 1: 5000	MÅLT	
		TEGN Sv.Sv.	AUG. 1968
		TRAC G.G.	JAN. 1968
		KFR. Sv.Sv.	
NORGES GEOLOGISKE UNDERSØKELSE TRONDHEIM	TEGNING NR. 820-01		