Industrial minerals deposits map of the Fennoscandian shield

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Abstract. A new map product, Industrial Minerals Deposits of the Fennoscandian Shield is presented. The map is a result of cooperation between the Geological Surveys of Finland, Norway and Sweden, SC Mineral, Saint Petersburg, Karelian Geological Institute, Petrozavodsk, Russia and the Kola Science Center, Apatity, Russia. The purpose of the map is to show the most significant industrial mineral deposits of the Fennoscandian Shield and includes active mines and quarries, past producers, potential deposits and showings. About 10-20 %, with some variation between countries, of all registered industrial mineral deposits in each country's national database is plotted on the map. In total 576 deposits, 119 in Norway, 225 in Sweden, 119 in Finland and 115 in Russia, are shown on the map. These deposits illustrates the variation in type and distribution of industrial minerals deposits in the Fennoscandian Shield, and their location in different geological provinces. In total 35 different commodities are plotted. The most common group of commodities comprise carbonates, feldspar, quartz, olivine, talc and magnesite, which together make up 65% of the total. The map will in due course be accompanied by an online database where the deposits and their most important information will be presented on an interactive map.

Keywords.
Industrial minerals, Fennoscandia, Mineral deposit, Mining, Finland, Norway, Russia, Sweden.

1 Introduction

The industrial minerals map of the Fennoscandian Shield (Fig. 1) is a continuation of the FODD prosject (Fennoscandian Ore Deposit Database) it covers the same area and has the same geological base map as the Fennoscandian ore deposit map of the (Eilu et al 2013). The deposits are grouped into 5 size classes according to our best knowledge of size and tonnage.

2 Finland

In 2011 there were 33 active industrial mineral and industrial rock mines and quarries in Finland. Raw material of Palaeoproterozoic calcitic marble deposits of southern Finland are used for cement, fillers and paper pigments. Dolomitic marbles are mined for agricultural use. Proterozoic soapstone hosted talc is mined from four open pit mines in eastern Finland. Finland has been the largest talc producer in Europe for decades. Finnish talc concentrate is used mainly in paper and pulp as well as paint and coating industries. Finland is the only European producer of wollastonite, a by-product from crystalline limestone deposit of Ihalainen at Lappeenranta. Industrial rocks are mined for rock wool and cement production, from six deposits. The Archean carbonatite hosted apatite deposit Siilinjärvi in eastern Finland is the biggest active industrial mineral mine in Finland and the only active phosphate mine in western Europe. Apatite concentrate is used in fertilizer plant nearby. Quartz is produced from three deposits of which one in south western Finland is also producing feldspar. In addition, there are industrial mineral deposits, which are not currently in production like diamondiferous kimberlites and kaolin deposits in eastern Finland, hard rock lithium deposits in western and southern Finland and world class phosphate deposit Sokli in northern Finland.

2 Norway

The most important industrial minerals in Norway are olivine, limestone and quartz. Norway is the world's leading producer of olivine and produces about 50% of the worlds annual production. Until recently there were 3 olivine producing mines, however presently (Feb. 2013) only one is active. The map contains several olivine occurrences with indicated resources in excess of 50 Mt. The Norwegian limestones occur essentially in two geological settings, one as part of the Cambro-Silurian succession of the Oslo rift and one as the part different tectonic units in the Norwegian Caledonides. The limestones of the Oslo rift are all low metamorphic marble that is used for cement production and agricultural use. The occurrences comprise several tens of deposits of high grade marble that is raw material for GCC (ground calcium carbonate) and some that burned for PCC (Participated calcium carbonate) production. The Norwegian quartz deposits occur as rock forming quartzites, hydrothermal quartz and as part of pegmatites all with a very variable purity. In Norway there are several potentially large deposits of apatite. They occur in various geological settings, alkaline intrusions within the Caledonian orogenic belt, as part of layered intrusions of the Bjerkreim-Sogndal intrusion, and as part of alkaline intrusions of the Oslo rift.

3 Russia

The Kola Peninsula comprises the following important industrial minerals provinces. On the central eastern Kola, the 1.9 Ga Keivy terrain contains some of the world's largest kyanite/staurolite deposits. The Devonian alkaline Khnibiny complex hosts some of the largest apatite deposits and is perhaps one of the most important industrial mineral provinces within the Fennoscandian shield. The Northern part of Karelia comprises a number of feldspar, muscovite, quartz, kyanite and large garnet deposits. The south eastern Karelia is the only place in the world where shungite rock is mined. Reserves of shungite in the order of several hundred million tons are found along the northern part of the Lake Onega. Easth of the lake Ladogathe graphite deposit Ihala was discovered. The probable reserves of the ore field includes about 200 Mt graphite ore and 6.4 mt tons of graphite. A thick trending quartz vein zone (Melomais prospect) was discovered in the eastern Karelia. It is large enough to be considered as an unique potential quartz occurrence in the Fennoscandian Shield.

4 Sweden

The largest industrial mineral deposits of Sweden are carbonate rock deposits, comprising Paleozoic limestone deposits and Early Proterozoic crystalline carbonate rock deposits. Currently, there are approximately 20 carbonate deposits in operation. Quartz and feldspar have been produced from several hundreds of minor deposits known from all over the country. Only the largest deposits are shown on the map.

Large talc, olivine and magnesite deposits associated with ultramafic rocks are found within the Caledonian thrust nappes of Sweden. Current production of soapstone and talc occurs at Handöl. Fluorite-mining is planned at the Storuman sandstone-hosted fluorite deposit. Several small fluorite occurrences are known but not exploited. Graphite is also known from several small occurrences but only a few has been, or are, of economic size. The most promising prospect is currently at Nunasvaara, in the Kiruna area, and several deposits around Kringeltjärn, central Sweden. Apatite is present in large quantities in the apatite-iron-ores in the Bergslagen and Norrbotten areas but apatite extraction has been minor. In addition, minor occurrences of high alumina silicates, mica, anthophyllite, nepheline, wollastonite, garnet, beryll and clay minerals are also presented in the map (Fig 1).

5 References

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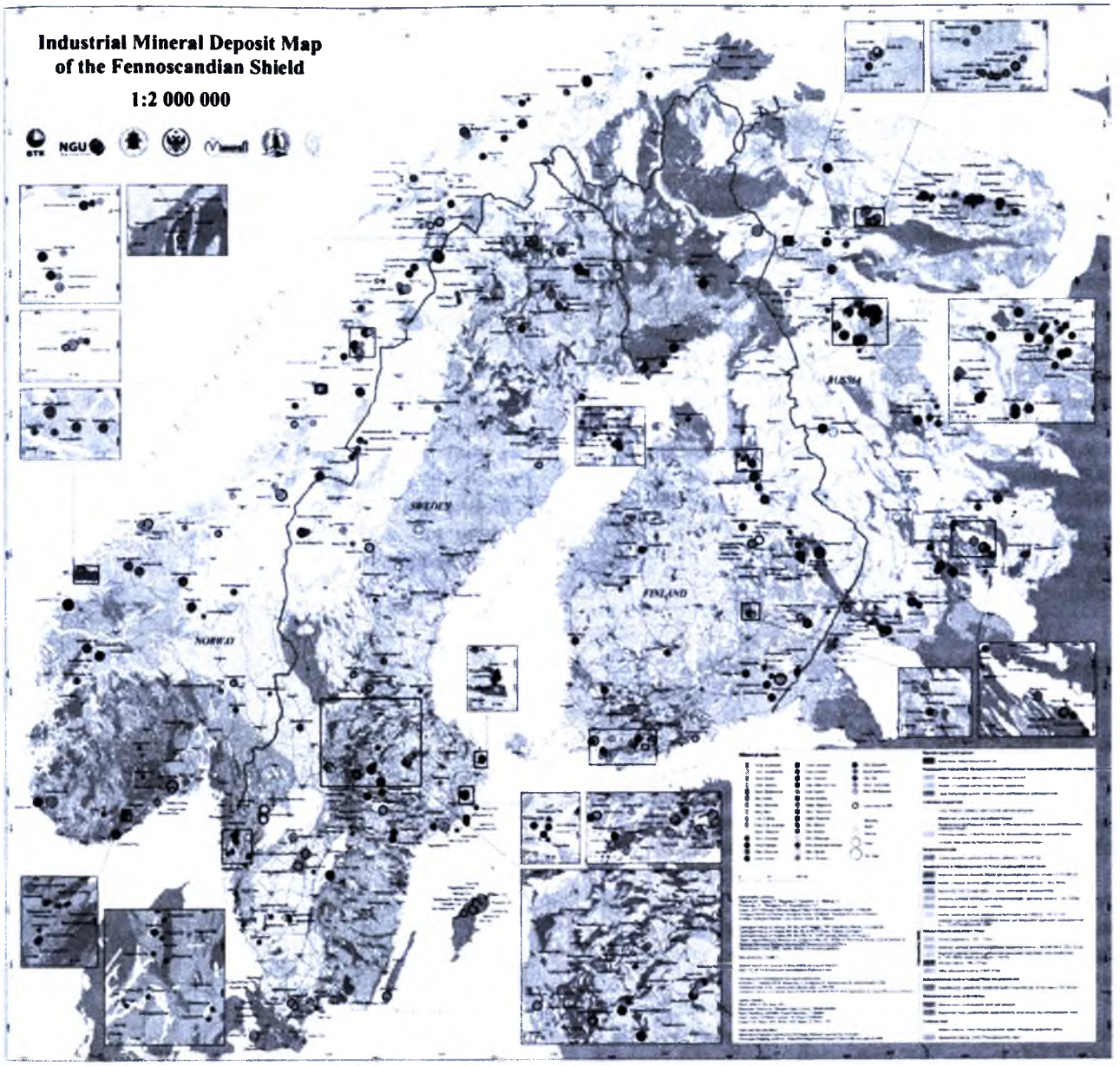

Fig 1 Industrial Minerals Map of the Fennoscandian Shield