



Lithium, Cobalt and Graphite occurrences in Europe, Results from GeoEra FRAME project wp 5

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The H2020 GeoERAFRAME project (www.frame.ineg.pt) consists of a partnership of 11 European geological surveys. Geographical and geological information was collected including the genetic type of the different commodities. In the EU, data show that there are 1195 registered occurrences, prospects or deposits of Li, Co and graphite, of these only 17 are active. The data classify the occurrences according to their genetic type, occurrence type and production status. The data have been supplied from geological surveys national databases and in this compilation, we regard all Co deposits with a mean Co >100ppm as potential occurrences for Co. For the other commodities, Li bearing minerals or graphite must be identified or explored for to be included. Even if our compilation has shown that the different national resource databases contain data of variable quality, with a lot of shortcomings, inconsistencies and errors, the overall quality is good enough to assess the EU potential.

The Lithium deposits can be group into the following types: i) High grade Li deposits including Li-rich LCT pegmatites, rare metal granites and atypical stratiform deposits such as Jadar. The distribution of lithium in Europe shows a strong clustering highlighting the Li potential of the Variscan belt of south and central Europe. Representative examples are Sepeda pegmatites (103 000t Li₂O – grade 1.0%) or Beauvoir rare-metal granite (325 260t Li₂O – grade 0.78%). Medium-grade Li deposits are represented by hydrothermal deposits such as greisens and Li-bearing quartz veins associated to some peraluminous rare metal granites (Cinovec 2 715 010 Li₂O – grade 0.42%).

Cobalt is a common minor constituent in a number of different ore types. In Europe, most of the known Co-bearing deposits and showings are clustering in the Nordic countries (Finland, Sweden and Norway). In the Nordic countries, the deposits mostly represent magmatic Ni-Cu and Fe-Ti-V deposits and VMS deposits, whereas elsewhere in Europe genetic types are more varied from sediment-hosted, to lateritic and S-element vein types, among others. The only active mines producing cobalt are located in Finland. Kevitsa mine in northern Finland is a large low-grade Ni-Cu-PGE deposit, which produced 591 t of Co in 2018. Kylylahti mine is a small-sized Outokumpu-type Cu-Zn-Ni-Co deposit, which produced 278 t of Co in 2018. Terrafame is a large, low-grade black-shale hosted Zn-Ni-Cu-Co mine that produces Co as by product to Ni and Zn.

Graphite is a common mineral in rocks throughout Europe. However, find economically interesting deposits are rare. The bulk of the graphite occurrences occur in Archean or Proterozoic rocks of Fennoscandia and Ukraine. In addition, a number of amorphous graphite occurrences are found in Phanerozoic rocks in Austria. There are also a large number of showings where the genetic type is unknown. Active mines are situated in Ukraine, Austria and Norway. The graphite bearing rocks are typically organic rich para-gneiss often associated with carbonates and iron formations. The graphite content varies from 2-3% up to over 40%. The Trælen deposit in Norway is the world's richest graphite deposit in current production with an average ore grade of 31%.

How to cite: Gautneb, H., Gloaguen, E., and Törmänen, T.: Lithium, Cobalt and Graphite occurrences in Europe, Results from GeoEra FRAME project wp 5, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-7025, <https://doi.org/10.5194/egusphere-egu2020-7025>, 2020