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MOSTMEG

Predictive models for strategic metal rich, granite-related ore systems based on mineral and geochemical fingerprints and footprints

Motivation

Predominant metals and associated by-products in granite-related ore systems are indisputable constituents of value chains related to several industries, such as the steel manufacturing, welding and electronics, batteries and chemicals.

Many of these products play a vital role in the current transition to low-C intensity and sustainable economic growth models, being essential to widespread use of, e.g., renewable energy systems, all forms of electric mobility and high-tech digital devices. Since the recycling rates for many of these metals are still low and their feasible substitution is not guaranteed in the near future, primary production will continue to prevail in market shares and should grow to meet the anticipated increase in demand. However, some extra difficulties are expected before the strong hegemony of a few countries and companies that characterizes current supply chains (quite evident for W, Sn, Nb and Ta) can be suitably overcome. Thus, significant investments in mineral exploration endeavours are imperative, not only to re-evaluate resources already delimited and to stimulate new discoveries, but also to diversify the source regions of the minerals needed to support the on-going technological (r)evolution.

Many examples of rare metal, granite-related ore systems exist in the European Variscan belt and, historically, mining has been important in Portugal, Spain, UK, France, Austria and Germany. However, little has been done in the last decades to comprehensively assess the existing resources and find new ones. The MOSTMEG project concurs to that end, providing innovative R&D paths to reorient exploration strategies, thus increasing the chances to boost the domestic production in the near future and reduce the dependence of EU on external sources with respect to some mineral raw-materials.

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Partnership

Web page

https://mostmeg.rd.ciencias.ulisboa.pt/

Project duration

2020-2023 (36 months)

Objectives

The MOSTMEG project intends to develop and validate predictive models for strategic metal rich, granite-related ore systems. To this end, some concepts and exploration strategies will be refined, combining mineral and geochemical criteria that can be used as pathfinders or vectors to mineralization centres.

Several specific objectives are intended, according to the surveying scale (regional or local) and its relationship to known occurrences/deposits (in green- or brownfield contexts), as well as to the mineralization type or style: quartz-lodes, breccia pipes and skarns enriched in W-Sn-F(-P-Bi-Sb-Cu)-bearing mineral associations, besides greisenized granite cupolas and (aplite-)pegmatite-hosted mineral assemblages incorporating Sn-Ta-Y-F(-W-Nb) or Li-Cs-Be-Ta(-P-Rb).

The project seeks to identify which minerals and/or geochemical (multi-element and isotopic) features might be used as proxies or vectoring/fertility tools to:

- *Identify the most promising litho-stratigraphic sections and/or granite suites, and foresee their potential metal endowment;*
- *Predict the likely direction and distance to ore systems;*
- *Recognize the presence of (or the potential for) different styles of mineralization;*
- *Distinguish the most relevant metal concentration and deposition processes at the ore system scale, thus controlling (decisive?) paths towards high-grade resources; and*
- *Infer ore assemblages enriched mineral phases likely to bear by-products of economic value (depending on the mineralization type, these may include Ga, Ge and In, besides Be, Bi, Cs, Cu, Nb, Rb, Sb, Ta, Y), but which often form complex (inter-grown) matrices which make processing/treatment difficult.*

Concurrently, new geochronology data (constraining the magma emplacement/cooling, as well as the main ore stages) and additional information on structural features potentially controlling the vertical and lateral extensions of the ore system, will be used in the predictive modelling design.

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