Metallogeny of the Nordics: Fennoscandia and Greenland

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Bedrock of Fennoscandia and Greenland has a well-established mining and mineral exploration history focusing mainly on base and ferrous metals. Today, we see the region with a significant potential of a very large set of metals and minerals. Especially, nearly all included into the to the latest EU set of critical and strategic raw materials (Grohol et al. 2023) could be sourced from Finland, Greenland, Norway and/or Sweden. This is essentially grounded in that: 1) the bedrock is similar to major mineral-rich terrains globally but uniquely for Europe, 2) the Nordic countries comprising a land area comparable in size to the most mineral-rich parts of Canada, USA, Australia, South Africa, or Brazil, 3) there is a continuous presence of modern mining, and 4) locally developed leading-edge mineral exploration, mining, and mineral-processing technology (e.g., Eilu 2012, Boyd et al. 2016, Kolb et al. 2016, Jonsson et al. 2022).

Nordic metallogeny rather directly relates to supercontinent evolution of the region. From early Archaean protocontinent formation, through formation, rifting, and disintegration of Kenorland, Columbia, Rodinia, and Pangaea, to the current continental-margin processes, we see formation of major Au, Cr, Cu, Fe, graphite, Nb, Ni, PGE, phosphate, REE, talc, Ta, Ti, V, and Zn deposits. Mafic-ultramafic magmatic processes have produced Ni-Cu-Co-PGE, PGE-only, Cr, and Ti-V(-P) deposits, submarine hydrothermal systems Cu-Zn-Ag-Au, active margins porphyry Cu-Au and Mo, rifting-related carbonatite and peralkaline magmatism REE-P-Zr-Hf-Nb-Ta-fluorite, somewhat enigmatic processes Kiruna-type Fe±P±REE and IOCG, metamorphic processes Au, graphite, high-purity quartz, and talc-magnesite, passive-margins mineral-sand Ti(-REE-Zr-Hf), and euxinic passive margin settings produced black shale-hosted Ni-Co-Cu-Zn and V-U-Mo deposits.

What is not so well established, or even not much thought about, but where there may well be significant critical metal potential, relate, at least, to 1) large-scale rifting and the recently proven presence of evaporites in the Palaeoproterozoic of the northern Fennoscandia (e.g., sediment-hosted Ni and Au-Co±PGE, and copperbelt-type *sensu lato*), 2) Co, Sc, and V resources in IOCG, and IOA deposits, 3) Be, REE and Li in granitoids (excluding pegmatites), 4) Li in metamorphosed Thacker Pass type deposits, 5) Ga and Sc resources in Ti-V-Fe deposits. Serious work should be aimed on all these. Do we have such deposits, and if yes – where? Also, reasons why there aren't certain globally significant deposit types here (e.g., Carlin gold, evaporite potassium, sediment-hosted Li, red-bed Cu) should be investigated – perhaps the of view non-existence (of economic ores) is not true, after all?

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