

Critical metals in the mines and dumps of W Bergslagen, Sweden

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Hard rock mining in the Palaeoproterozoic Bergslagen ore province in south central Sweden dates back at least 1000 years. A conservative estimate of the number of old mines and prospects in this region is about 8500, many with associated dumps. Typically, only a single metal was extracted from these operations. In some cases precious or other metals were not detected, and for a number of elements, now considered “critical”, the market at the time was limited or non-existing. Hence, these occurrences represent a potential source of sought-after metals today. Here, we highlight some examples of critical metals in such dumps and mineralisations.

Increased REE concentrations occur in two iron oxide belts in western Bergslagen. The westernmost one consists of Kiruna-type apatite iron-oxide deposits (AIO). The REEY contents in the AIO mineralisations reach up to 1 wt.%. Here, REEY occur as a substitution component in fluorapatite, and in monazite-(Ce), xenotime-(Y), allanite-(Ce) and minor REE-fluorocarbonates. The other belt is the c. 100 km long REE-line, located 50 km to the east, sub-parallel to the AIO belt. The REE-line is composed of a number of magnetite-dominated skarn mineralisations. Albeit LREE-dominated some are extremely rich in total REEY, with dump samples reaching concentrations of 31 wt.%. REEY are mainly hosted by REE-silicates and fluorocarbonates. Several deposits are also enriched in Ga (200-900 ppm) and Ge (20-130 ppm). Adjacent to the REE-line, quartz-banded iron oxide (BIF) mineralisations are also enriched in REE (up to 8000 ppm REEY).

Elevated In concentrations have been known in the Filipstad district for some time (e.g. Jonsson et al. 2013, and references therein), and additional anomalous In concentrations (>20 ppm) have now been verified in sphalerite from several sulphide mineralisations in this general area. In mostly occurs as substitutions in sphalerite or Cu sulphides, and in rare cases as roquesite (CuInS₂).

References:

Jonsson, E., Högdahl, K., Majka, J. & Lindeberg, T. 2013. Can. Mineral. 51, 629-641.