In-situ trace element petrogenetic characterisation of Fe-oxide mineralisation in Bergslagen

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The Bergslagen ore field contains over 6000 mineral deposits the majority of which are dominated by Fe-oxide mineralisation of variable styles including banded iron formation (BIF), magnetite-skarn and apatite bearing iron ore. The Fe-oxide deposits are generally considered to have formed from sedimentary processes in the case of the banded iron formations, metamorphosed sedimentary and /or metasomatic processes in the case of the magnetite-skarn deposits and magmatic intrusive processes in the case of the apatite iron ores (Allen et al. 1996).

Trace element contents of Fe oxides have been used to investigate the formation of many types of mineral deposit through for example, determination of the provenance of host rocks, hydrothermal conditions of precipitation and the sources of metals in the minerals (Dupuis & Beaudoin 2011, Dare et al. 2014). In the case of BIF where Fe-oxides precipitate from the water column, their composition has been shown to preserve characteristics of the chemistry of the water body from which they precipitate at the time of their formation. The rare earth element (REE) chemistry of BIF has been used to provide insights into the marine depositional environments (Lawrence et al., 2006). In-situ trace element analyses of magnetite was recently applied to the Stollberg deposit in Bergslagen to show that the magnetite classifies as "skarn" type rather than that from volcanogenic massive sulfide deposits (Frank et al. 2022). The Stollberg study also showed host rock control on the trace element content of magnetite, particularly when the particular BIF layer is sulfide bearing which could be a possible pathfinder for sulfide mineralisation (Frank et al. 2022).

We report the in-situ trace element contents of magnetite and hematite from selected Fe-oxide deposits in Bergslagen with specific focus on the Fe-oxide mineralisation on Utö and in the Riddarhyttan area. The island of Utö in eastern Bergslagen hosts an excellent example of banded magnetite and hematite mineralisation within interbedded limestone and fine-grained felsic volcanogenic sedimentary rock. The study aims to provide insight into the classification and depositional environment of the Fe-oxide mineralisation. We also aim to test the findings reported in Frank et al. (2022) where it was shown that sulfide bearing host rock exerts a specific control on the trace element composition of the magnetite.

References

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