

## Major and trace element analysis of sphalerites from W Bergslagen, Sweden

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Sphalerite is common in many of the polymetallic mineralisations in the Paleoproterozoic Bergslagen ore province in south central Sweden. Besides being the major source of Zn, sphalerite is also an important sink for “critical” metals such as In, Ga and Ge, and elevated In concentrations have been found in a few deposits in western Bergslagen (e.g. Jonsson et al. 2013, and references therein). Recently, we have analysed the major and trace element composition, including “critical” elements, of sphalerites from 19 different mineralisations in western Bergslagen, to test both a combination of methods, and the potentially more widespread occurrence of such elements in this region. The sphalerites were analysed by electron microprobe analyser (EMPA) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). Utilisation of the two methods also provided the opportunity for a direct spot-to-spot comparison of their performance in trace-element analysis of sphalerite.

The analytical results verified some of the already known substitutions occurring in the sphalerite structure (i.e.  $\text{In}^{3+} + (\text{Cu}^+, \text{Ag}^+) \leftrightarrow 2\text{Zn}^{2+}$  and  $\text{Fe}^{2+} + \text{Cd}^{2+} + \text{Mn}^{2+} \leftrightarrow 3\text{Zn}^{2+}$ ), however, several trace elements known to occur in sphalerite (e.g. As, Sn, Se, Sb, Ga, Ge) yielded concentrations below the detection limits of the LA-ICP-MS inhibiting examination of other possible substitutions. Most of the studied sphalerites have In concentrations >20 ppm and the highest concentrations were found in samples from Hällefors and Gåsborn (400 and 330 ppm, respectively). Interestingly, these sphalerites also exhibit notable concentrations of either Cu or Mn.

As was expected, the direct comparison of EMPA results to those of LA-ICP-MS, showed the significantly better performance of the latter in detecting trace-level concentrations, provided an accurate calibration procedure had been followed. Importantly, it also highlighted the poor precision in analysis and subsequent problems in the application of EMPA data on trace elements in sphalerite.

### References:

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