Colloform Zn-S-O-Al-Pb-Si as a precursor to sphalerite in the Grieves Siding peat, Tasmania

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A nucleation and growth pathway for Zn sulfides that involves amorphous precursors to the crystalline products has been established in experiments [1] but so far not in a natural environment. We present results on a colloform phase from the Grieves Siding metal-rich peat deposit in western Tasmania, which is hypothesized to be an amorphous predecessor of sphalerite.

The colloform phase consists of Zn, S as well as O (up to 18.5 wt. %), Al (up to 8.5 wt. %), Pb (up to 2.9 wt. %), Si (1.7 wt. %) and Fe, Cd, Cu, Ag, Sb, As, and also lighter elements such as H and C. Brighter bands in backscattered electron images correspond to highest concentration of Zn and S, whereas the darker bands contain more O, Al, Si and C. Lead and other trace metals display no correlation with the bands. The colloform phase lacks any electron backscatter pattern, which indicates that the phase is amorphous or non-crystalline. Infrared spectra have distinctive signatures matching that of water, aluminosilicate and in some cases, organic molecules.

The amorphous and non-equilibrium state, the compositional heterogeneity, i.e. the occurrence of non-stoichiometric ZnS, and the Al-Si-O-C phase resembling the substrate, strongly suggest that colloform Zn-S-O-Al-Pb-Si is a precursor phase, possibly in colloidal form, that ultimately transforms into crystalline sphalerite following the Ostwald Step Rule [2]. Significant influence of microorganisms and its organic products are also postulated to be involved in the mineral formation process.

[1] Luther, Theberge & Rickard (1999) *Geochim. Cosmochim. Acta* **63**, 3159-3169. [2] Ostwald (1897) *Zeitschr. Phys. Chem.* **22**, 289-330.