PYRITE NANOPARTICLES: POTENTIAL SOURCE OF As IN GROUNDWATER

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Arsenian pyrite is found as pitted grains or fine-grained aggregates [1]. Within the hydrothermal regime in which such arsenian pyrite form, Au-Sb and As_2S_3-Sb_2S_3 melts are stable [2, 3]. Experiments were conducted to investigate the mechanism of formation of nanoparticulate arsenian pyrite by reacting synthetic pyrite with As_2S_3-Sb_2S_3 melt at 500°C.

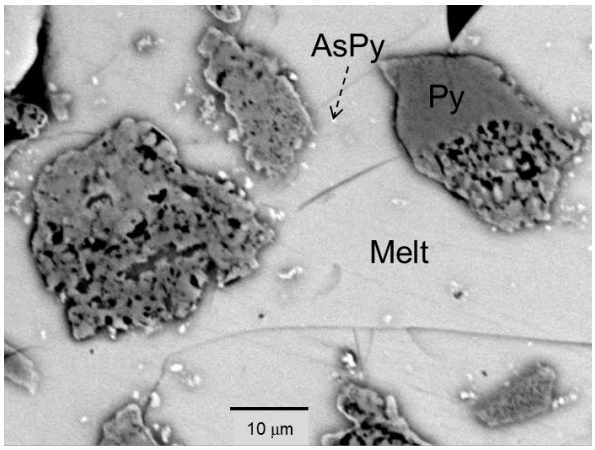

Fig.1. BSE image showing disintegration of pyrite reacted with As_2S_3-Sb_2S_3 melt at 500°C to form arsenian pyrite nanoparticles.

Pyrite became extremely perforated, disintegrating into nanoparticles of arsenian pyrite, which dispersed into the As_2S_3-Sb_2S_3 melt. No such effects were seen with pure Sb_2S_3 melt. These grains could not be reliably analyzed. EPMA analysis confirmed the presence of pyrrhotite and metallic Fe in the shreded part of the pyrite suggesting strong reduction of pyrite. The cause for the dispersal is not known, however, these nanoparticles formed by exposure of pyrite to an As-bearing melt may be the elusive As-carriers that get incorporated in sediments during erosion and under suitable conditions release the As causing groundwater contamination.

[1] Simon *et al.* (1999) *Am. Mineral.*, **84**, 1071–1079, [2] Okamoto & Massalski (1984) *J. Phase Equilib.*, **5**, 166–171, [3]Tomkins *et al.* (2004) *Econ. Geol.*, **99**, 1063–1084.