

Precipitation of abundant hydrothermal clay at ultramafic-hosted vent fields on the Mid-Atlantic Ridge – implications for seafloor massive sulfide resource estimates

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During the 2016 BIGMAR cruise (R/V *Meteor*) to the Mid-Atlantic Ridge, rock samples were collected using the ROV *Quest 4000* from active and inactive hydrothermal vent sites within the Ashadze, Semyenov and Irinovskoe vent fields. These vent fields occur on or proximal to oceanic core complexes that expose ultramafic substrate and host some of the largest known accumulations of seafloor hydrothermal deposits.

During previous research cruises to these vent fields, hydrothermal rock samples recovered from hydrothermal mounds, chimneys and talus fields by dredge or ROV have been largely reported as massive sulfide, as is typical of most other seafloor hydrothermal vent sites. However, during the BIGMAR cruise, many clay-rich, sulfide-poor samples were collected from hydrothermal structures that were originally thought to be composed primarily of massive sulfide material.

Preliminary analysis of these samples indicates that they are composed of clay minerals such as talc and chamosite, and contain only minor abundances (<1%) of sulfide minerals. Many samples also contain mineral fragments of olivine, pyroxene, plagioclase and ilmenite, which are interpreted to have originated from the underlying basement and transported to the surface by hydrothermal fluid.

The proportion of clay versus sulfide material in the mounds is currently unknown. However, based on ROV surveys, the abundance of clay may be significant enough that deposit volume estimates that assume a massive sulfide composition cannot be reliably used for resource calculations for high-temperature ultramafic-hosted vent fields on the Mid-Atlantic Ridge.