Novel groups of sulfur oxidizing bacteria in coastal sediments

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The biological and chemical oxidation and thereby Biological and chemical oxidation and thereby detoxification of sulfide is essential to sulfur cycling in coastal sediments. Still, the identity, diversity and abundance of involved microorganisms are largely unknown. We explored sulfur-oxidizing prokaryotes (SOP) in tidal sediments by using molecular and cultivation techniques. Gene libraries of three key enzymes revealed a high diversity of mostly uncultured *Gammaproteobacteria*. Consistently, 16S rRNA gene phylogeny uncovered numerous organisms most closely related to thiotrophic gammaproteobacterial symbionts of marine invertebrates. In particular, SOP affiliating with symbionts of the marine tubeworm *Oligobrachia haakonmosbiensis* accounted for up to 4 % of the microbial community. Microautoradiography indicated autotrophic capabilities in these organisms, which are consistent with a thiotrophic lifestyle. This group occurs in sulfidic sediments worldwide and may play an important role in sulfur oxidation. Moreover, we proved the presence of the rDSR pathway in a member of the widely distributed *Roseobacter*-clade via metagenomics, gene-FISH, and cultivation. The identified organisms extend our view on the community structure and function of SOP beyond well-known SOP, such as *Beggiatoa* and *Epsilonproteobacteria*

Combination of SEM-Cathodoluminescence and fluid inclusion microthermometer of quartz veins in Hugo Dummett porphyry Cu-Au deposit, Mongolia

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The Hugo Dummett porphyry copper-gold deposit in Oyu Tolgoi, South Mongolia is a high-sulfidation type deposit which consists of Cu-Au bearing quartz veins. Cathodoluminescence (CL) analysis using scanning electron microscope (SEM) and fluid inclusion microthermometer were performed to elucidate the combination between CL structures, fluid inclusion microthermometer of different quartz generations, and ore forming process of the Hugo Dummett deposit.

Hydrothermal quartz from quartz-sulfide veins in the Hugo Dummett porphyry copper-gold deposit was analyzed by SEM-CL and revealed, the following textures: (1) euhedral growth zones (2) embayed and rounded CL-bright cores, with CL-dark and CL-gray overgrowths, (3) concentric growth zones (4) microbrecciation and (5) CL-dark/bright microfractures. These textures indicate that many veins have undergone fracturing, growth of quartz into fluid-filled space and dissolution of quartz.

Fluid inclusions are identical in euhedral growth zone, CL-dark and CL-bright veins, and consists of liquid rich, vapor rich and polyphase (halite and chalcopyrite) types. Homogenization temperature of quartz veins CL-bright intensity fluid inclusions range from 243-550°C. CL-gray intensity fluid inclusions in chalcopyrite dominated quartz veins are showing up to 532°C homogenization temperature. Quartz core with CL-bright intensity gives higher homogenization temperature (243-342°C) than CL gray rim (147-172°C). Salinities vary from 4.9-8.7 wt % NaCl equiv.

SEM-CL image reveals multistage crystal growth, zoning, microbrecciation and microfracturing in quartz sulfide veins and those features are indicating hydrothermal process was complicate at the Hugo Dummett deposit. Homogenization temperatures increase from CL-gray to CL-bright intensity quartz veins. Even within the single vein quartz crystal core has higher homogenization temperature than growth zone.