

## SEM-CL analysis of quartz gangue in the Big Creek Mining District, Idaho, USA indicate that CL textures predate quartz crystal formation and final optical orientation

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SEM-CL textures uniquely identify quartz in veins and alteration assemblages with various stages of hydrothermal deposition in the Big Creek Mining District of central Idaho. These mesothermal veins and disseminated mineralization associated with hydrothermal alteration are related to the Idaho batholith, and are located within a large structural zone that is enriched in gold and silver locally.

In a number of slides CL textures does not correspond to grain contacts identified using polarized light microscopy with crossed nicols (PLM). This indicates that the CL patterns formed prior to crystallization and associated optical characteristics. In several slides, grain boundaries do correspond to CL patterns and in others the relationship between specific grains and CL texture is vague. Within a stibnite vein, a quartz grain in CL contains a hexagonal pattern with multiple alternating bands of CL surrounding a uniformly dark core. This indicates that the c-axis is perpendicular to the slide. PLM confirms this interpretation as the optic axis is also perpendicular to the slide for most of the crystal. However, a portion of the crystal has a different optical orientation as it shows variable extinction with stage rotation. Therefore, this portion of the grain recrystallized at some time later than the CL texture and crystal formation suggesting that CL may provide precipitation and crystallography data earlier than CL. In the last stage of mineralization CL texture in quartz suggests the presence of a multitude of breccia fragments. However the PLM analysis of this area of the slide shows discrete quartz grains with no evidence of brecciation. Therefore, in many cases SEM-CL reveals textural evidence of deposition and brecciation events in quartz prior to crystal formation with associated grain boundaries and the establishment of optical properties. Later recrystallization may change original optical properties in specific grains but not the original CL texture.

## Hydrogen isotope ratio of Acid Volatile Sulfur in saltmarsh sediments

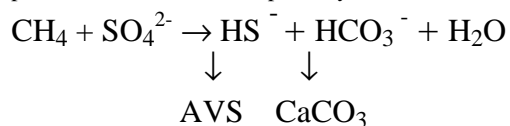
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Reported what probably are the first  $\delta D$  measurements of Acid Volatile Sulfur (AVS) extracted from sediments. The samples represent the upper 50 cm of a salt marsh from Sapelo Island, GA, USA. The site is sparsely vegetated by *Spartina alterniflora*. Sediment core and pore water samples were collected, the core samples being taken within few centimetres from the pore water sampling sites. The sampling devices, pore water diffusion equilibrators ("peepers"), were covered using 0.2  $\mu m$  pore sized dialysis membrane. Sampling of the pore waters was done anaerobically at 1-2 cm intervals from the sediment water interface. The AVS from the sediment samples was released using a novel method, which involved treatment of pre-weighed, dry samples (5 cm interval) with 100% phosphoric acid under vacuum conditions. The gases produced by this reaction included  $CO_2$ ,  $SO_2$  and  $H_2S$ . The  $H_2S$  was converted to hydrogen by reacting with hot cupric oxide and then passing the resulting water over hot uranium.  $\delta D$  of this hydrogen was measured and the values ranged from -500 to -615‰. The  $\delta D$  of the 100% phosphoric acid used was -140‰. The  $SO_2$ :  $H_2S$  ratio was ~2 for all samples. The  $\delta D$  values strongly point to organically bound sulfur as the source of  $H_2S$ . This organically bound sulfur in turn can be considered to have resulted from methane oxidation in the presence of sulfate via the pathway:



This argument is supported by the down core variation in pore water  $SO_4$  and Dissolved Inorganic Carbon (DIC) concentrations and the relatively low  $\delta^{13}C$  values (-19.5±5‰) for the carbonate fraction ‰.