

# ACTIVE AND EXTINCT CHIMNEYS IN THE ENDEAVOUR VENT FIELD, JUAN DE FUCA RIDGE, NE PACIFIC OCEAN SHOW SIMILAR MINERALOGY WITH DISTINCT TRACE METAL FINGERPRINTS

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Hydrothermal vents are an important source of Fe and other trace metals in marine systems (Fitzsimmons et al 2017). This study examines solid-phase speciation changes that occur in hydrothermal chimney structures over time. We have analyzed a time series of hydrothermal vent chimney material from the Endeavour Segment of the Juan de Fuca Ridge. The Juan de Fuca Ridge is a tectonic spreading center 200 km off the coast of British Columbia, at depth of 2250m below sea level. The Endeavour Vent Field consists of hydrothermally active and extinct vent chimneys with ages that span from presently forming to 5200 years old.

Hydrothermal chimneys are structures that form at hydrothermal vents when the hot, reduced, metal-rich hydrothermal fluids come in contact with cold, oxygen-rich seawater. These structures are unique, extreme environments with distinct microbial communities. As spreading centers expand, these chimneys move with the crust away from their source and go extinct.

We used synchrotron X-ray fluorescence (XFM) imaging and X-ray absorption near-edge structure (XANES) to characterize the vent material from active and extinct chimneys. In the youngest sample, collected from an active vent, we see iron (Fe) bound with sulfur (S) as sulfides, and equant, euhedral mineral shapes. In the older samples distal to the vent, we found less S overall, and less euhedral morphology. Of the solid-phase S that was present, more of it was bound to copper (Cu), and less to Fe than in the younger samples. This suggests preferential transformation and loss of Fe sulfide.

Preliminary measurements of phosphorus (P) found at the rock-water interface of a sample of intermediate age identified Fe(III)phosphate, which is likely biogenic.

Measurements of S and heavier elements were made at the XFM hard-X-ray beamline at the NSLS-II while P spectroscopy

was done at the Tender Energy Spectroscopy (TES) beamline, NSLS-II.

Figure 1. Light microscope photomosaic image of Endeavour sample 1939 Rck 13, 5750 YBP. Weathered margin on the left. Scale bar 3mm.

Figure 2. X-ray fluorescence map of detail area. Iron fluorescence shown in red, sulfur in green, and calcium in blue. Scale bar 1mm.

