Organic Carbon and Iron-rich Particles in Deep Ocean Hydrothermal Plumes, Von Damm Vent Field, Mid-Cayman Rise

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Hydrothermal plume particles were collected from the Von Damm hydrothermal vent, Mid-Cayman Rise [1]. Particles and fluids from a high-temperature vent (226ºC) and lower-temperature vent (107ºC) were collected by in situ filtration using the SUspended Particle Rosette (SUPR) sampler [2].

Sources of organic carbon (C) to the plume include chemoautotrophic microbial communities and vent macrofauna [3]. Scanning Transmission X-ray Microscopy (STXM) based C 1s and iron (Fe) 2p images and X-ray absorption near edge structure (XANES) verify the presence biomolecules such as proteins, lipids, polysaccharides, and chitin. 16S rRNA gene sequencing indicates a rapidly evolving buoyant plume microbial community dominated by chemosynthetic sulfur-oxidizing bacteria. Particles close to the vent are associated with shrimp (chitin-rich tissues), and microbial protein-rich cells become more numerous farther from the vent. These findings indicate that Fe minerals are nano-particulate and associated with particulate organic C (POC) at all elevations investigated within the plume.

[1] Kinsey & German (2013) EPSL 380, 162-168.
[2] Breier et al. (2014) Deep-Sea Res. I 94, 195-206.
[3] Bennett et al. (2013) G-cubed14, 317-327.