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## Massive Barite Deposits on the Northern Gulf of Mexico Continental Slope: Precipitation Processes

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### ABSTRACT

The northern Gulf of Mexico continental slope is known for its extensive number of hydrocarbon seeps. Authigenic carbonate and barite frequently occur as products of the seepage process. Barite ( $\text{BaSO}_4$ ) is more pervasive than once thought. Seafloor observations and samples acquired at sites indicate that barite occurs as chimneys, cones, crusts, irregular mound-like buildups up to meters high and as a material disseminated in host sediment. Barites exposed at the seafloor usually have a porous fabric and are typically covered by dark-brown manganese (Mn) rich coatings. Samples of barite may also contain minor amounts of magnesium-calcite, pyrite, and detrital silicates. On a  $\delta^{34}\text{S}_{\text{Barite}}$  versus  $\delta^{18}\text{O}_{\text{Barite}}$  diagram, many deposits show linear or concave-upward trends that project down toward the isotopic composition of seawater sulfate. The trend suggests that barite is formed from seawater sulfate that has been isotopically modified to varying degrees by biological sulfate reduction processes. Variations in sulfur and oxygen isotopes occur within individual study sites but there are common trends across multiple sites. The variations primarily reflect local controls on the flux of barium rich seep fluids, e.g., rate changes in bacterial sulfate reduction and different possible electron donors in a closed or semi-closed pore-fluid system. The results suggest that geochemical and petrographical characteristics of barite offer a promising tool to reveal new information about biogeochemical processes at sites of fluid and gas expulsion.