Petrography and Geochemistry of Barite Chimneys Associated with Hydrocarbon Vents on the Gulf of Mexico Slope

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Barite chimneys up to 30 cm high were recently documented and recovered from hydrocarbon venting areas on the Louisiana Slope in the Gulf of Mexico in water depths of 510-520 m. The chimneys are dominated by barite (BaSO4) associated with minor amounts of pyrite, iron oxide, Mg-calcite, and detrital silicates. The barites display distinct string-like and dendritic-like morphologies assembled from rosette assemblages that are typically 20 to 40 μm in diameter. The interiors of chimneys exhibit macroscopic growth layers 1 to 5 mm thick which alternate between dark-gray and light-yellow colors.

Compared with barites from hydrothermal, marine, and continental settings, the Gulf of Mexico (GOM) barites are more enriched in Sr (average 15.5 mol% and maximum 30 mol%) and Ca (average 2.8 mol% and maximum 4.6 mol%). Backscatter images and electron microprobe traverse analyses indicate that most barite crystals exhibit rhythmic chemical zonations because of the variation of concentrations of Sr and Ca. The $\delta^{34}S$ (from 20.30 to 28.87‰) and $\delta^{18}O$ (from 9.5 to 13.6‰) of GOM barites suggest that the barite chimneys may form at or above the sediment-water interface from Ba-, Sr-, and Ca-rich formation fluids dissolving the underlying Jurassic-age salt and mixing with sulfate-rich seawater. Bacterial reduction of sulfate took place in the formation of some barite chimneys.

Environmental Implications of a Gas Well Blowout in Northwest Louisiana - A Case Study

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Oil and gas exploration in northern Louisiana has been ongoing since the 1920s.During this time occasional blowouts have occurred which have impacted the environment. In March, 1994, a Sligo Field well experienced an unusual blowout in that the event propagated to the surface through an adjacent abandoned well.

While drilling through the fractured Thompson-Pettet interval at a depth of 5000', a pressure kick, caused by a loss of drilling fluids, occurred. The well control devices activated and prevented loss of the well. However, the pressure front moved up the well's uncased annulus until reaching the base of the cemented surface casing where it dispersed laterally in the Nacatoch formation at a depth of approximately 1000'. This was the uppermost portion of the uncased hole. The pressure front propagated through the Nacatoch until it encountered the poorly cemented annulus of the abandoned Hardman #1well, located approximately 300' to the south of the drilling location. After moving up the annulus of the Hardman #1 well and charging the fresh water sands of the Wilcox system, local residential water wells and the drilling rig's water supply well became flowing artesian. Several hours later sands and fluids began erupting, creating a large cavity on the outside of the casing surrounding the Hardman #1 well. The artesian impact lasted approximately four days until the pressure front dissipated. Subsequent sampling of the rig supply well determined the well to be contaminated with benzene, a known human carcinogen.

The Louisiana Department of Environmental Quality, in conjunction with the operator, is currently investigating the extent of contamination with the goal of ensuring the health of the local residents and the protection of the environment.

3-D Seismic Reveals Potential New Play In Shallow Water

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Recently acquired shallow water 3-D seismic data from the West Cameron and High Island areas in the Gulf of Mexico reveal deep subsurface features previously imaged only sporadically on 2-D data. The new, deeper penetrating and higher resolution 3-D data reveal a potentially prospective zone between 4.5-5.0 seconds (22,000-25,000 ft), which is characterized by an unconformable, regionally mappable decollement zone. Productive, overlying structures associated with major fault systems which sole out on this horizon are generally known. Massive structures that have never been tested with the drill bit are now readily apparent below the decollement.

The regional nature of this deep zone is presented with its relationship to shallower producing fields. Preliminary examination of the new data reveals a correlation between shallower fields and associated major fault systems and the deeper prospective horizons. This scenario suggests that the deep zone may be in communication with and charging the shallower reservoirs with hydrocarbons, analogous to the documented petroleum migration phenomenon at Eugene Island block 330 field.

Further geological investigations would be crucial in placing these new findings in perspective and to help evaluate the potential for a new, deeper play in the shallow waters of the Gulf.