
Biogenic Nontronite from Marine White Smoker Chimneys

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Abstract: Clay samples of greenish colour were collected from submarine hydrothermal chimneys of the Galapagos Rift and Mariana Trough. Mineralogical and chemical investigations of the clay by scanning and transmission electron microscopy, X-ray diffraction, differential thermal analysis, infrared-spectroscopy, X-ray fluorescence, and determination of specific surface area, and oxygen isotope composition identify it as a well crystallized nontronite. This nontronite of hydrothermal origin has a nearly monomineralic character, a low Al-content, and a formation temperature of 21.5 to 67.3° C. The most remarkable characteristic, however, of the nontronite deposit is its microstructure, a network of microtubes composed of fine frequently folded clay sheets. These delicate filaments show close similarity in size and form to sheath forming bacteria. The correlation between clay mineral and chemical characteristics, as well as biological conditions at marine hydrothermal smoker chimneys, let us suggest that Fe oxidizing, sheath forming bacteria are playing a decisive role in nontronite formation at these sites.

Key Words: Authigenic formation • Bio-catalysis • Hydrothermal • Microstructure • Nontronite • Scanning electron microscopy • Silicate smoker chimney

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