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MINERALOGICAL NOTES

AN OCCURRENCE OF GREIGITE IN LAKE SUPERIOR SEDIMENTS

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ABSTRACT

Greigite (cubic Fe_3S_4), in the form of small, black magnetic grains, has been found in unconsolidated late-glacial and postglacial sediments in Lake Superior. It probably formed in reducing micro-environments around pieces of decaying organic matter.

Greigite has been identified in unconsolidated late–glacial and post-glacial sediments from Lake Superior. To the writer's knowledge, this is the first reported occurrence of this mineral in sediments of the Great Lakes.

Greigite was first described as a new mineral by Skinner, Erd, and Grimaldi in 1964 who found it concentrated in varve-like layers in lacustrine sediments of Tertiary age from the Kramer-Four Corners area, San Bernardino County, California. In Lake Superior greigite was found in four cores. Two of these cores were taken off the Minnesota coast (47°09′N, 91°18′W; 47°53.0′N, 89°37.5′W) and the other two were from the southeastern part of the lake, about 50 miles north of Munising (47°07.4′N, 86°27.5′W; 47°07.4′N, 86°24.6′W). The greigite occurs in several types of sediment: red varved clay, gray varved clay, massive gray clay, and a brown silty sediment. The varved sediments were deposited as the glacier retreated out of the lake about 11,000 to 9,500 years ago (Farrand, 1969). The massive gray clay and the brown sediment are seen from stratigraphic studies to be younger, but have not been dated with accuracy.

The greigite is disseminated throughout the sediment in the form of small irregular grains ranging in diameter from a fraction of a millimeter to 3 mm. The grains are strongly magnetic, black, with a dull sooty to submetallic luster, although the surfaces of some grains have a yellowish brown crust-like tarnish, possibly caused by partial alteration to limonite.

To obtain X-ray data, the greigite was ground to finer than 63 μm, mounted on a glass slide and X rayed with a Philips powder diffractometer using CuKα radiation. Pulse-height discrimination was used to help eliminate a high background owing to iron fluorescence. The pattern produced was similar to that shown by Berner (1967) for

artificially prepared greigite except that the peak at about 26° 2θ was not as intense. Three strong peaks indicating spacings of 2.95, 2.46, and 1.74 Å are present and weaker peaks indicated spacings of 3.46, 1.90, 1.28, and 1.007 Å. These values agree with those given by Skinner, Erd, and Grimaldi (1964). No other phases are present in amounts detectable by this method.

Although X-ray-amorphous hydrated iron sulfide is found commonly in thin layers and small grains in Lake Superior sediments, greigite is the only crystalline iron sulfide that has been identified. *Eh* values of these sediments range from zero to +300 mv (Callender, 1969; Nussmann, 1965). Berner (1969) describes the formation of iron sulfides in reducing micro-environments around pieces of decaying organic matter. The greigite in Lake Superior sediments probably formed in this way.

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OCCURRENCE OF TESCHEMACHERITE IN A GEOTHERMAL WELL AT BROADLANDS, NEW ZEALAND

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ABSTRACT

Teschemacherite, NH_4HCO_3, occurs at the wellhead of a drillhole where it forms by reaction between gases separating from deep geothermal waters.