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NOTES

Degradation of clay minerals by H_2O_2 treatments to oxidize organic matter*

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SOIL and sediment samples which contain organic matter are usually treated to remove organic matter prior to clay mineralogical investigations. Organic matter may cause an exothermic reaction between 250 and 500°C in DTA investigations, or may cause a high background and prevent parallel orientation in the preparation of oriented slides for X-ray diffraction studies. Recently, we observed that the addition of H_2O_2 to a soil may cause the pH of the soil–water–H_2O_2 slurry to become quite acid.

Grim (1968) points out that several 2:1 clays are solubilized at low pH's, consequently we investigated the effect of H_2O_2 on three 2:1 reference clays.† When H_2O_2 was added to an organic matter free clay, the pH change was negligible. Mixtures of 5 g of clay and 2 g of sucrose were then prepared, and H_2O_2 added. After oxidation of the sucrose, the clays were washed with distilled water using a vacuum, Millipore filter apparatus, and then freeze dried. X-ray diffraction studies were made on oriented slides of K-saturated samples.

The H_2O_2 (without sucrose) treatment caused a small degradation (as indicated by the intensity of (001) diffraction lines) of these clays. The H_2O_2 plus sucrose treatment caused (001) intensities of H-31 and Fisher bentonite to reduce to about 1/3, and of Libby vermiculite to about 1/10, of the intensities of the untreated (001) diffraction lines (Fig. 1).

Jackson (1956) recommends that 1 N sodium acetate (pH 5·0) buffer be used to solubilize carbonates in soils and sediments prior to study of the clay fraction. When this buffer was added to the soils reported above, and H_2O_2 added, the pH of all samples rose from 6·9 to 8·0. X-ray examination of reference clays in which sucrose had been oxidized (H_2O_2) in a sodium acetate buffered slurry revealed little degradation of the clays. The diffraction patterns were intermediate between the untreated (top) and H_2O_2 treated (middle) patterns of Fig. 1.

It is often obligatory that organic matter be removed from soils and sediments prior to studying the clay

Table 1. Effect of H_2O_2 on pH's of soil : water slurries

Soil	pH Soil + H_2O	pH Soil + H_2O + H_2O_2
Norfolk AO	4·4	2·8
Norfolk Ap	6·8	5·9
Lakewood A0	4·6	1·9
Lakewood A2	4·2	1·5
Norfolk A1	5·1	2·2
Immokalee B3	5·0	3·3

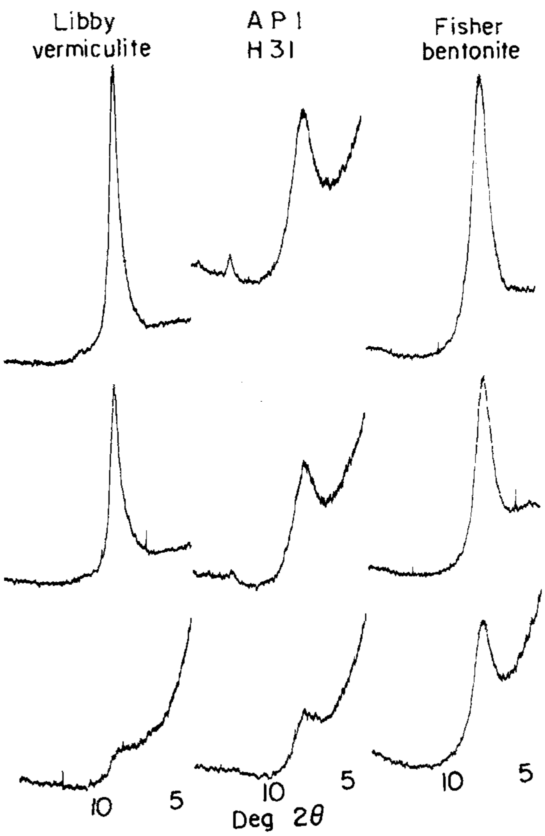

Fig. 1. Effect of organic matter removal treatment on the X-ray diffraction properties of three clays. Top, untreated; middle, H_2O_2; bottom, H_2O_2 plus sucrose. Nickel filtered, copper radiation.

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†Apl H-31 and vermiculite (Libby, Montana), were obtained from Wards Natural Science Establishment, Inc., Rochester, New York; Fisher bentonite was obtained from Fisher Scientific Company, Springfield, New Jersey.

Table 2. Effect of H_2O_2 on pH's of clay : water : sucrose slurries

Clay	pH Clay + H_2O	Clay + sucrose + H_2O + H_2O_2
API H-31	9·2	2·1
Libby vermiculite (< 2 μ)	9·0	3·0
Fisher bentonite	8·4	1·8

fractions. When H_2O_2 is used to remove organic matter, the pH of the slurry should be monitored, and a buffer used to prevent strongly acidic conditions.

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