

THE CLAY MINERALOGY OF THE BLUE BAND OF THE NO. 6 COAL OF ILLINOIS

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INTRODUCTION

The Blue Band is a prominent clay parting occurring almost universally in the No. 6 coal of Illinois, Kentucky, and possibly Indiana. In the samples studied it has an average thickness of 3 inches and lies generally about 36 inches above the base of the coal, regardless of regional variation of coal thickness.

The Blue Band's unusually widespread occurrence and particular stratigraphic location render its mode of origin an interesting, unsolved problem. A clay-minerals study of the Blue Band, utilizing X-ray diffraction techniques, was undertaken with the hope that it might aid in resolving the Blue Band's genesis.

SAMPLING

The Illinois State Geological Survey supplied nine well-core samples and one outcrop sample for the study. The sample localities form an arc 300 miles long from Stark to Gallatin counties (Fig. 1).

The samples varied little in thickness, three inches being the average. Stringers of coal were incorporated in the clay with sharp contacts between the clay and coal. The amount of clay varied considerably and in an inversely proportional manner with the organic material. The color was uniformly gray.



FIG. 1.—Locations from which samples were taken.

ANALYTICAL PROCEDURES

The samples were fractionated to the less-than-one-micron particle size with sodium polyphosphate used as a dispersing agent. The selected material was suspended in water and sedimented on glass microscope slides. For each sample two similar-

ly oriented slides, each requiring three milliliters of suspension, were prepared.

X-ray analyses were made on an untreated slide, after heating to 450°C, after soaking at 550°C for 30 minutes, and after treatment with ethylene glycol.

Johns, Grim, and Bradley's (1954) method of analysis was used for interpreting the diffraction curves.

CLAY MINERALOGY

Kaolinite, chlorite, and illite are present in varying quantities in all samples. An asymmetrical 10 a.u. reflection and a diffuse reflection between 10 and 16 a.u. after glycol treatment suggest that chlorite, montmorillonite, and/or vermiculite are interlayered with the illite. Heating to 450°C and 550°C results in a sharpening of the 10 a.u. reflection as the expanded layers collapse.

The presence of chlorite is confirmed by reflections at 14, 7, and 3.5 a.u. Upon ignition to 450°C the 14 a.u. reflection is lost, and the 7 and 3.5 a.u. reflections are somewhat intensified.

Since the chlorite material is broken down by the heating, the remaining reflections must come from kaolinite, the (001) and (002) reflections of which coincide with chlorite's 7 and 3.5 a.u. reflections.

Accurate quantitative differentiation between chlorite and kaolinite is impossible because of the increase in intensity in the 7 and 3.5 a.u. reflections following the chlorite breakdown. However, kaolinite occurs in probably greater amounts than chlorite.

Illite is present in quantities ranging from 20 to 55 %, averaging 35 % of the total clay minerals. Taken jointly chlorite and kaolinite vary from 45 to 80 % and approximate 65 %.

Clay mineral variation is not governed by geographical distribution.

CONCLUSIONS

The clay mineral assemblage gives no critical indication of the Blue Band's mode of origin. Altered volcanic ash is usually characterized by montmorillonitic material. With its low montmorillonite content, the Blue Band's assemblage tends to discredit the theory of origin by volcanic ash fall.

However, it is conceivable that, because of the extremely acid environment in which the Blue Band must have been deposited, volcanic ash might not alter to the expected montmorillonite value.

Petrographic and heavy minerals studies should be of great profit in the final determination of the genesis.

ACKNOWLEDGMENTS

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LITERATURE CITED

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