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X-RAY INVESTIGATIONS OF ARKANSAS GRAPHITES*

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Two deposits of graphite located in Arkansas have been brought to the attention of the Arkansas Resources and Development Commission. These deposits, located in Garland and Perry Counties, were reported during 1950.

The Garland County deposit was reported by the Hamilton Brothers of Hot Springs. The ore is a black bituminous graphitic shale containing 6.71 per cent fixed carbon as determined by Mr. Troy W. Carney, Chief Chemist, Geology Section, Arkansas Resources and Development Commission. Due to its comparative hardness it was relatively easy to crush the ore to a size of 60 per cent through 48 mesh and 40 per cent through 35 mesh.

John M. Springer of Hot Springs reported the Perry County deposit. This deposit has two distinct forms, clay-ball and shabby-shale. The fixed carbon content of the clay-ball ore was 1.70 per cent, while that of the shabby-shale ore was 1.73 per cent, as determined by Mr. Carney. The softness of the clay-ball ore made it difficult to pulverize to a size of 30 per cent through 48 mesh and 70 per cent through 35 mesh.

The pulverized ore was examined by means of a Phillips Geiger X-ray Spectrometer. The pattern of the Garland County sample revealed a strong association with quartz and traces of Illite. No trace of a graphite pattern indicates an amorphous structure. After simple flotation in a toluene-water mixture, the x-ray analysis revealed Kaolinite ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$) and Illite ($2\text{K}_2\text{O} \cdot 3\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot 24\text{SiO}_2 \cdot 12\text{H}_2\text{O}$) in addition to quartz. Beneficiation by a hydrofluoric acid treatment¹ resulted in the removal of the quartz and other impurities. The absence of an x-ray diffraction pattern indicated that this graphite is an amorphous type.

The analysis of the Springer sample proved to be somewhat more difficult. Cuts of pulverized clay-ball and shabby-shale ores were supplied by Mr. Williams and Mr. Carney of the ARDC. X-ray analysis of the clay-ball cut revealed association with quartz, Kaolinite and Illite. The absence of a graphite pattern again indicated an amorphous type. The shabby-shale cut resulted in a similar pattern of quartz and Kaolinite, but with extra lines indicating Sericite, an alteration form of mica that approaches Illite. Flotation by toluene-water did not totally eliminate the quartz, Kaolinite, Illite and Sericite. In both cases, treatment with hydrofluoric acid removed all impurities and resulted in a pattern that was essentially background. The graphite, therefore, has an amorphous structure.

The low carbon content of these graphite ores and the necessity of beneficiation by chemical means practically eliminates any possibility of profitable commercial recovery.

¹Z. V. Harvalik, "Flotation of Graphite from Arkansas Ores", Arkansas Academy of Science, 1951.

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