THE THERMAL CONDUCTIVITY OF SX-5, A FINE-GRAIN COMMERCIAL GRAPHITE*

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ABSTRACT

Measurements are being made on the thermal conductivity (k) of a fine-grain commercial extruded graphite, SX-5, which is produced by the Speer Carbon Co. of St. Marys, Pa. Three different methods are being used to make measurements of k from -100°C to 2600°C; the temperature interval -100°C to 400°C is covered by measurements of the thermal diffusivity (from which the thermal conductivity is subsequently calculated) using a transient technique, from 200°C to about 850°C a steady state, linear heat flow, series comparison method is employed for the measurement of k, and at temperatures above 1000°C, a resistance-heating, radial heat flow method similar to that described by Powell and Schofield (1939) is employed. Preliminary results indicate that as the temperature is increased beyond 200°C, the thermal conductivity decreases as the reciprocal of the absolute temperature which is consistent with current ideas of phonon scattering effects in graphite at elevated temperatures. The anisotropy in the heat conduction seems to be somewhat greater than would be expected from measurements of anisotropy based on electrical resistance, thermal expansion and x-ray diffraction. Electron micrographs show a matrix which has an appearance similar to that which has been observed in very highly isotropic graphites, within the matrix are regions with a very highly-layered structure whose dimensions along the layers are 5000Å - 50,000Å. Relationships between the observed structure of the material and the observed heat-conducting properties are highly speculative at this time. Observations on thermal expansion and other pertinent data will be reported.

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