

Abstract of Paper 1 for the Eighth
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The Influence of Structural Faults
on the Non-uniform Oxidation of
Boronated Graphite.

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The surfaces of single crystals of graphite, which was 'doped' with boron at high temperatures, have been studied, following oxidation, using optical and electron microscopy. Spark source mass spectrography confirmed that, by heating boron with graphite at 3000°C., a concentration of up to 2.2% (wt./wt.) of boron (uniformly distributed in the c-direction) could be introduced into the graphite matrix. Transmission electron microscopy carried out on annealed and unannealed boronated crystals confirmed the results of Turnbull, Stagg and Eeles⁽¹⁾ as to the manner of the accommodation of the boron, and enabled the average size of the vacancy loops (left behind when the substitutional boron atoms diffuse away temperatures beyond 1800°C.) to be determined.

For the more heavily 'doped' samples (0.5 to 2.2%), boronation causes an enhancement of the initial rate of oxidation, but the rate of subsequent oxidation is slower (compared with oxidation of the original single crystals) owing to the formation of a thin layer of relatively impermeable product composed of carbon, boron and oxygen. Experiments with the less rich boronated graphite (ca. 0.1%) have shown that, at the site of each localized region of attack by oxygen, boron is liberated from the graphite and rapidly converted to boric oxide or to a series of boric acids, depending upon the level of moisture impurity in the gas phase.

From the pattern of attack by oxygen, the preferential accumulation of boron at various kinds of structure faults, including sub-grain boundaries, may be readily identified.

(15 min.)

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(1) Turnbull, Stagg and Eeles, Carbon, 1966, 5, 387.