

GRAPHITE CRYSTAL GROWTH*

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ABSTRACT

Graphite crystals were grown by precipitation from carbon-saturated metal solutions, using both slow-cooling and steady-state temperature gradient techniques. Emphasis was placed on controlled crystal nucleation and growth at low supersaturation. Crystal habits include thin platelets (as commonly observed in earlier studies) as well as thick platelets and columnar crystals (not previously observed). The best crystals approach ideal lattice perfection; twist boundaries on the basal plane are absent over large regions; tilt disorder is less ideal, with an apparent minimum of $\sim 3'$ to $6'$ half-height breadth to the gaussian distribution of c-axis orientation. The relatively few dislocations emergent on basal-plane cleavage surfaces are revealed by oxidation and chemical etching. Consistent with high lattice perfection, the crystals cleave readily on the basal plane without tearing. With respect to crystal morphology, the basal planes are the only well-developed and extensive planes; occasionally a well-formed prism ($10\bar{1}0$) or pyramid ($10\bar{1}1$) face is found. Non-basal faces usually are formed of terraces parallel to the basal plane, the terraces being too narrow to form coherent optical reflections. Common twins are the $(11\bar{2}1)$ -

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type, while occasionally $(11\bar{2}2)$ -type twins are found. The twin angle of the former was found to be $20^{\circ} 50' \pm 5'$, in agreement with the calculated angle of $20^{\circ} 27'$. The twin structure appears to nucleate during crystal growth and not to be related to the initial nucleation event.