

## **Intrinsically High Cross-Plane Thermal Conductivity of HOPG**

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Investigating the intrinsic thermal conductivity and phonon scattering mechanism in graphite is of great importance for both practical application in thermal management and theoretical interpretation of heat transfer in 2D materials. Ultrahigh anisotropic ratio and the correlation between in-plane and cross-plane thermal transport make it difficult to accurately measure thermal conductivity in both directions. Moreover, research on the heat transfer has been interfered by complex defects in graphite for a long time. In this work, in-plane and cross-plane thermal conductivity of Highly Oriented Pyrolytic Graphite (HOPG) are measured respectively by TDTR. The record high cross-plane thermal conductivity of 13.7 W m<sup>-1</sup>K<sup>-1</sup> is found, which is about twice higher than the commonly accepted value of 6~7 W m<sup>-1</sup>K<sup>-1</sup>. Our results indicate the intrinsically high cross-plane thermal conductivity in HOPG and provide an approach that could ultimately improve the heat dissipation performance of graphite heat sinks.