

Thermal Conductivity of Isotopically Enriched Silicon Carbide

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Abstract

Since the semiconductor silicon carbide presents attractive opportunities for the fabrication of novel electronic devices, there is significant interest in improving its material quality. Shrinking component sizes and high demands for efficiency and reliability make the capability to release excess heat an important factor for further development. Experience from Si and Diamond tells us that isotopic enrichment is a possible way to increase the thermal conductivity. We have produced samples of 4H-SiC that contain ²⁸Si and ¹²C to a purity of 99.5%. The thermal conductivity in the c-direction of these samples has been measured by a transient thermoreflectance method. An improvement due to enrichment of at least 18% was found. The result is valid for a temperature of 45K above room temperature. A preliminary study of the temperature dependence of the thermal conductivity demonstrates a strong temperature dependence in agreement with earlier reports for 4H.