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Temperature Dependence of the Minority Carrier Lifetime in n^- Epilayers of 4H-SiC[1] PAUL KLEIN, Naval Research Laboratory, AMITESH SHRIVASTAVA, TANGALI SUDARSHAN, University of South Carolina — Controlling the lifetime of minority carriers in n^- epilayers of 4H-SiC is of great current interest, as short lifetimes lead to a high forward voltage drop in high-voltage, bipolar switching devices. As such devices operate at elevated temperatures, the temperature dependence of the carrier lifetime is of particular interest. For materials where the lifetime is controlled by trapping at deep defects (e.g. Z1/Z2), increasing the temperature results in the thermal emission of trapped carriers, leading to an increase in the carrier lifetime. In this work the temperature dependence of the carrier lifetime, measured by time-resolved photoluminescence decay at low injection, has been studied in a range of epitaxial layers. In addition to the classic temperature dependence, some samples exhibit a lifetime that decreases rapidly with temperature in a thermally activated manner. This behavior is believed to result from the fact that the deep defect concentration is too low in these samples to limit the lifetime, and that other processes have become dominant.

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