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Photoluminescence Studies of Hydrogenated a-Silicon Carbide¹

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A series of PECVD grown silicon carbide samples differing in their carbon content was investigated by a near-IR FT-Photoluminescence (PL) technique. The goal of this study was to establish a correlation between carbon concentration in a-SiC and the observed luminescence signal. Variations in the observed temperature dependences of the PL signals in a-SiC are attributed to differences in the carbon content. The samples, initially kept at 18 K on a closed-cycle helium cryostat, were excited with Ar-ion laser light at 514.5 nm (with power ranging 5-30 mW; and a fluence of 0.5 to 3 W/cm²), and the luminescence was recorded with an InGaAs detector over the range of 1.5 eV to 0.67 eV. There was no change in PL intensity below 50 K; above 50 K the intensity decayed logarithmically up to room temperature. The increase of carbon content caused an increase in the PL on the higher energy side of the emission peak (approximately centered at 1.29 eV; FWHH = 0.3 eV) with concurrent intensity decrease on the lower energy side.

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