Time-dependent photo-induced electron paramagnetic resonance of Vc+ in semi-insulating 4H SiC: evidence of defect relaxation

HAIYAN WANG, MARY ZVANUT, Physics Department, University of Alabama at Birmingham — SiC is widely studied because of its superior electronic and physical properties. Many investigations focus on defect levels that act as efficient recombination centers and influence the carrier lifetime. We conducted photo-induced electron paramagnetic resonance (photo-EPR) studies of high purity semi-insulating 4H SiC by illuminating the sample with light of selected energy at 4K. Although several different defects were detected in the samples, the presentation will focus on the defect level of the carbon vacancy, Vc+. Steady state photo-EPR indicates that the intensity of Vc+ increases at 1.8 eV and reaches a peak at 2.3 eV. Time-dependent photo-EPR results for Vc+ are consistent with those obtained from steady state measurements. The data suggest that when Vc+ captures an electron from the valence band becoming V0c the energy required is about 1.8 eV, and when V0c releases an electron to the conduction band becoming Vc+ the energy required is 2.3 eV. Initial analysis indicates that lattice relaxation accounts for the energy difference between the plus- to-neutral and neutral-to-plus states. At the talk, we will present the details of these measurements and discuss additional support for the defect relaxation model.

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