Materials Science Forum 2007 vol.556-557, pages 355-358

EPR, ESE and pulsed ENDOR study of nitrogen related centers in 4H-SiC wafers grown by different technologies

Kalabukhova E., Lukin S., Savchenko D., Mitchel W., Greulich-Weber S., Gerstmann U., Pöppl A., Hoentsch J., Rauls E., Rozentzveig Y., Mokhov E., Syväjärvi M., Yakimova R.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

D-band electron paramagnetic resonance (EPR) measurements as well as X and Q-band field-swept Electron Spin Echo (ESE) and pulsed Electron Nuclear Double Resonance (ENDOR) studies were performed on a series of n-type 4H-SiC wafers grown by different techniques including sublimation sandwich method (SSM), physical vapor transport (PVT) and modified Lely method. Depending on the C/Si ratio and the growth temperature the n-type 4H-SiC wafers revealed, besides a triplet due to nitrogen residing on the cubic site (Nc), two nitrogen (N) related EPR spectra with g||=2.0055, g⊥=2.0010 and g||=2.0063, g⊥=2.0005 with different intensities. In the samples with low C/Si ratio the EPR spectrum with g||=2.0055, g⊥=2.0010 consists of a triplet with low intensity which is tentatively explained as a N-related complex, while in the samples with high C/Si ratio the triplet is transformed into one structureless line of high intensity, which is explained as being due to an exchange interaction between N donors. In the samples grown at low temperature with enhanced carbon concentration the EPR line with g||=2.0063, g⊥=2.0005 and a small hyperfine (hf) interaction dominates the EPR spectrum. It is attributed to N on the hexagonal lattice site. The interpretation of the EPR data is supported by activation energies and donor concentrations obtained from Hall effect measurements for three donor levels in this series of 4H-SiC samples.

Keywords

4H-SiC, EPR, ESE, Hall, Nitrogen, Pulse ENDOR, Si/C ratio