

EPR and ODMR defect control in AlN bulk crystals

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Abstract

The results of pulse electron paramagnetic resonance (EPR), electron nuclear double resonance (ENDOR) and optically detected magnetic resonance (ODMR) are presented to show the electron structure of deep level defect color center in AlN single crystals such as a nitrogen vacancy in neutral charge state (VN 0) as well as a new type of point defect such as exchange-coupled pair of the nitrogen vacancies (VN-VN). Analyzing spin density distribution of an unpaired VN 0 electron on different ions of AlN crystalline lattice by means of high frequency ENDOR technique (94 GHz) give us a possibility to calculate hyperfine and quadrupole interactions (QI) with ^{27}Al nuclei spins up to fourth coordinate sphere. Particularly data about quadrupole interactions allowed to estimate the fundamental parameter of AlN crystalline lattice in itself namely so called «crystalline field gradient» to be $4.9 \times 10^{20} \text{V/m}^2$ © 2013 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

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Keywords

Aluminum nitride, Deep level defects, Electron nuclear double resonance, Electron paramagnetic resonance, Optically detected magnetic resonance