

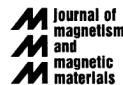


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Magnetic and structural properties of Fe ion-implanted GaN

Woochul Kim^a, Hee Jae Kang^b, Sam Kyu Noh^c, Jonghan Song^d, Chul Sung Kim^{a,*}

^a*Department of Physics, Kookmin University, 861-1, Cheongnung-dong, Songbuk-gu, Seoul 136-702, South Korea*

^b*Department of Physics, Chungbuk National University, Cheongju 361-763, South Korea*

^c*Korea Research Institute of Standards and Science, Daejeon 305-600, South Korea*

^d*Korea Institute of Science and Technology, Seoul 130-650, South Korea*

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Abstract

The magnetic and structural properties of Fe ion-implanted GaN was investigated by various measurements. XRD results did not show any peaks associated with second phase formation. The magnetization curve at 5 K showed ferromagnetic behavior for 900 °C-annealed sample. In zero-field-cooled (ZFC) and field-cooled (FC) magnetization measurements, the irreversibility and a cusp-like behavior of the ZFC curve were observed for 900 °C-annealed sample. These behaviors are typically observed in superparamagnetic or spin glass phase. While the temperature dependence magnetization of 800 °C-annealed sample showed non-Brillouin-like curve and it is not exhibited ferromagnetic hysteresis at 5 K. In XPS measurement, the coexistence of metallic Fe (Fe⁰) and Fe–N bond (Fe²⁺ and Fe³⁺) for Fe 2p core level spectra is observed in as-implanted sample. But 700–900 °C-annealed samples showed only Fe–N bond (Fe²⁺ and Fe³⁺) spectra. For Ga 3d core level spectra only Ga–N bonds showed for as implanted with 700–900 °C-annealed samples. From XPS results, it could be explained that magnetic property of our films originated from FeN structures.

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