Contribution ID: **10** Type: **Invited talk**

Vacancy-type defects in ion-implanted GaN probed by monoenergetic positron beams

Tuesday 10 December 2019 13:15 (25 minutes)

Gallium nitride is a direct wide-bandgap semiconductor and an ideal material for power electronics. In device structure fabrication, controlled impurity doping in a selective area is essential. Ion implantation is the most commonly used technique to control carrier concentrations. A drawback of ion implantation is the introduction of defects. Thus, controlling damage during and after ion implantation is a key for the reduction of residual defects in GaN. In the present study, we used monoenergetic positron beams constructed at University of Tsukuba and TUM FRM-II to study the annealing behaviors of vacancy-type defects in Mg-implanted GaN.

Mg and H ions were implanted into GaN to obtain 0.1 and 0.7-micrometer-deep box profiles with Mg and H concentrations of 1E19 cm-3 and 2E20 cm-3, respectively. For the as-implanted samples, the major defect species was determined to be Ga-vacancy related defects such as Ga-vacancy, divacancy, and their complexes with impurities. For Mg-implanted samples, an agglomeration of vacancies started at 800C annealing, leading to the formation of vacancy clusters. For Mg- and H-implanted samples, the hydrogenation of vacancy-type defects started after 800C annealing. Comparing with the annealing behavior of defects for the samples without H-implantation, the clustering of vacancy-type defects was suppressed, which can be attributed to the interaction between Mg, H, and vacancies.

Authors: UEDONO, Akira (University of Tsukuba); EGGER, Werner (Universität der Bundeswehr München); Mr KOSCHINE, Tönjes (Universität der Bundeswehr München); Prof. HUGENSCHMIDT, Christoph; DICKMANN, Marcel; ISHIBASHI, Shoji (AIST)

Presenter: UEDONO, Akira (University of Tsukuba)

Session Classification: Positrons

Track Classification: Positrons