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Dependence of Ferromagnetic Properties on Carrier Transfer in $(Ga_{1-x}Mn_x)N$ H. C. JEON, S. J. LEE, T. W. KANG, T. W. KIM, JOON-GOO KANG, K. J. CHANG, QSRC, DONGGUK UNIVERSITY SEOUL TEAM, ELECTRICAL AND COMPUTER ENGINEERING, HANYANG UNIVERSITY SEOUL COLLABORATION, DEPARTMENT OF PHYSICS, KAIST DAEJEON COLLABORATION — Among many types of DMS materials, $(Ga_{1-x}Mn_x)As$ DMS have been mostly studied. However, since the highest T_c obtained from the $(Ga_{1-x}Mn_x)As$ has been 172 K, which is too low for practical applications. As alternative DMS materials with the high T_c, $(Ga_{1-x}Mn_x)N$ DMSs are of current interest because their T_c values can be as high as room temperature. Theory predicts that the ferromagnetic properties observed in GaMnN material system depends on the occupancy of the Mn energy band in GaMnN and the position of the Fermi level relative to this band. Carriers (holes) in the Mn energy band are needed to mediate ferromagnetic interaction: the depletion and enhancement of carrier concentration in the band will change the ferromagnetic properties of GaMnN. Even though many studies concerning the growth and characterization of $(Ga_{1-x}Mn_x)N$ have been carried out, systematic studies are required to understand the carrier-mediated ferromagnetism which is assumed to play an important role in enhancing the Tc by increasing hole carrier concentrations. This work will demonstrate this concept by studying the carriers to mediate ferromagnetism in various GaMnN structures, hence affecting the ferromagnetic properties of the GaMnN.

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