Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Si co-doping of GaMnAs: a solution for removing As antisites Y.J. CHO, X. LIU, J.K. FURDYNA, University of Notre Dame — The primary defects that degrade the ferromagnetism of GaMnAs are believed to be Mn interstitials and As antisites. The former can be reduced by low temperature annealing after growth. However, so far no solution for removing As antisites in GaMnAs has been developed. In this connection we report the effect of Si co-doping on $Ga_{1-x}Mn_xAs$ films. For $x < 0.05$, Si co-doping decreases the Curie temperature compared to undoped GaMnAs. However, at higher Mn concentration Si co-doping has the desirable effect of improving both ferromagnetic and structural properties of GaMnAs. To achieve a high Mn concentration in GaMnAs the growth temperature has to be sufficiently low to prevent the formation of MnAs clusters, but this introduces a high density of As antisites in GaMnAs, thus degrading its structural and ferromagnetic properties. However, when such growth of GaMnAs is accompanied by Si co-doping, x ray diffraction results show that such co-doping removes almost all As antisites in GaMnAs with high Mn concentration. Furthermore, magneto-transport and magnetization measurements show that the ferromagnetic properties of thick Si co-doped $Ga_{1-x}Mn_xAs$ ($x > 0.1$) films are greatly improved compared to samples without Si. This suggests that Si co-doping provides an effective solution for removing As antisites in GaMnAs at high Mn concentrations.

Yongjin Cho
University of Notre Dame

Date submitted: 25 Nov 2007 Electronic form version 1.4