

Abstract No. Soo0296

Short-range and Long-range Structural Orders in Mn/GaAs Digital Alloys Studied by X-ray Absorption Fine Structure and X-ray Diffraction Methods

Y. L. Soo, G. Kioseoglou, S. Kim, X. Chen, H. Luo, Y. H. Kao (SUNY, Buffalo), Y. Sasaki, X. Liu, and J. K. Furdyna (Notre Dame)

Beamline(s): X3B1

X-ray absorption fine structure techniques have been employed to probe the local structure and effective chemical valency of Mn atoms in Mn/GaAs *digital alloys*. Digital-alloy samples containing alternately grown Mn and GaAs layers were prepared by molecular-beam-epitaxy with different thickness of GaAs layers separating the nominal Mn monolayers. Lattice constants of the digital alloys have been found to increase linearly with the Mn/GaAs ratio in the samples by x-ray diffraction. Our x-ray results demonstrate that Mn atoms in the nominal Mn monolayers actually combine with GaAs to form (Ga,Mn)As alloys with Mn atoms substituting for Ga in the GaAs host. This rules out the possibility of dominant MnAs cluster formation. Also, the effective chemical valency of Mn in the samples is estimated to be positive but appreciably lower than 2+, suggesting possible formation of minute and disordered Mn clusters in the III-V host.

Acknowledgments: This research is supported by DOE, NSF and DARPA

References: Y. L. Soo, G. Kioseoglou, S. Kim, X. Chen, H. Luo, Y. H. Kao, Y. Sasaki, X. Liu, and J. K. Furdyna "Studies of Mn/GaAs Digital Alloys Using X-ray Absorption Fine Structure and X-ray Diffraction Methods" Appl. Phys. Lett. **80**, 2654-2656.

