Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Interaction of Mn with Ge-quantum dot surfaces and its impact on quantum dot growth and morphology[1] PETRA REINKE, CHRISTOPHER NOLPH, JOSEPH KASSIM, JERROLD FLORO, University of Virginia — The magnetic doping of Ge-quantum dots (QD) and Ge thin film materials has garnered considerable interest due their anticipated use in nanoscale spintronics device structures. In this study we probe with scanning tunneling microscopy the interaction of Mn with the growth surfaces in strain-driven synthesis of Ge-QDs on Si(100)-(2x1). The growth surfaces are the Ge-QD{105}facet and the Ge(100) surface of the wetting layer (WL). Mn interactions with the QD{105}facet is particularly interesting, and shows the formation of Mn-islands with a geometry bounded by the surface reconstruction, and a backbonding of Mn-d electrons into the surface states of the rebonded Ge{105}facet. Annealing introduces (<570 K) dramatic changes in bonding, and initiates intermixing of Ge and Mn. Further increase in the temperature drives the Mn-surface diffusion and leads to the formation of germanide clusters. In the co-deposition of Mn and Ge with 2-23 at% of Mn, the morphology of the Ge QDs is gradually modulated, QDs are significantly smaller for high Mn concentrations, with a concurrent thickening of the WL. We will discuss the co-deposition process in the framework of surface processes in the Mn-Ge-QD system.

[1]We acknowledge NSF for support of this work through award number DMR-0907234

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Date submitted: 09 Nov 2012 Electronic form version 1.4