Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Theory of magnetic circular dichroism in GaMnAs[1] JIAN-MING TANG, MICHAEL E. FLATTÉ, University of Iowa — We present a newly developed theoretical approach to calculate the magnetic circular dichroism in diluted magnetic semiconductors. Our approach uses the tight-binding method to incorporate the spin-orbit coupling and to obtain the electronic structure over a sufficiently wide energy range. The optical transitions from the valence band to the impurity band that can not be treated in the effective mass theories are included in our calculations. We consider GaMnAs, in which the Mn dopants interact with the GaAs host through the p-d exchange interaction. Our calculations show spin-polarized acceptor states, and resonances within the valence bands. The local density of states near the valence band edge is significantly enhanced by these resonances and qualitatively different from what is obtained from models based on rigid-band shift. We find that the optical transition from deep in the valence band to the impurity band can be stronger than the transition from the valence band edge to the conduction band edge, and can account for the broad positive peak in the magnetic circular dichroism data.

[1]This work is supported by ARO MURI DAAD19-01-1-0541.

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Date submitted: 11 Jan 2006 Electronic form version 1.4