Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Tuning magnetic exchange interactions in crystalline thin films of substituted Cobalt Phthalocyanine[1] NAVEEN RAWAT, LANE MANNING, KIM-NGAN HUA, RANDALL HEADRICK, Univ of Vermont, MICHAEL BISHOP, STEPHEN MCGILL, National High Magnetic Field Lab, florida, RORY WATERMAN, MADALINA FURIS, Univ of Vermont — Magnetic exchange interactions in diluted organometallic crystalline thin film alloys of Phthalocyanines (Pcs) made of a organo-soluble derivatives of Cobalt Pc and metal-free (H_2Pc) molecule and is investigated. To this end, we synthesized a organosoluble CoPc and successfully employed a novel solution-based pen-writing deposition technique to fabricate long range ordered thin films of mixtures of different ratios ranging from 1:1 to 10:1 H_2Pc:CoPc. Our previous magnetic circular dichroism (MCD) results on the parent CoPc crystalline thin films identified different electronic states mediating exchange interactions and indirect exchange interaction competing with superexchange interaction. This understanding of spin-dependent exchange interaction between delocalized π-electrons with unpaired d spins along with the excitonic delocalization character enabled the further tuning of these interactions by essentially varying the spatial distance between the spins. Furthermore, high magnetic field ($B < 25$ T) MCD and magneto-photoluminescence show evidence of spin-polarized band-edge excitons in the same materials.

[1]This work was possible due to support by the National Science Foundation, Division of Materials Research MRI, CAREER and EPM program awards: DMR- 0722451, DMR- 0821268, DMR-1307017 and DMR-1056589, DMR-1229217

Naveen Rawat
Univ of Vermont

Date submitted: 05 Nov 2015 Electronic form version 1.4