Magneto-optical spectroscopic studies of solid and solution-phase tetra-phenyl porphyrin.

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Tetraphenylporphyrin (TPP) is a synthetic heterocyclic compound that serves as a model system for porphyrins found in heme proteins, cytochromes and photosynthetic cofactors. TPP can accomodate a heavy metal ion in the center; D-shell ion porphyrin complexes with a crystalline solid phase are of particular interest for magnetic studies because of the possibility of macroscopic long-range magnetic order of the ion spins. We have investigated the 5K magnetic properties of poly-crystalline thin films of the heme protoporphyrin IX analogue tetra-phenyl porphyrin, complexed with Zn, Mn and Cu and deposited through a room temperature capillary pen technique that produces grain size in the 100 micron to 1mm range. Our novel experimental setup measures the UV/VIS, linear dichroism and magnetic circular dichorism simultaneously, incorporates a photoelastic modulator and a microscopy superconducting magnet for high-field (5T) measurements. In addition, we present 25T data on samples from the new split magnet at NHMFL. We present solution and crystalline data on metal-complexed TPP; data are analyzed in terms of A and B-type MCD using a perimeter model. We find good agreement with previous solution data, and novel crystalline phase spectra that are correlated to the long range ordering of the solid state.

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