Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Magnetic Anisotropy in Organic-Based Magnetic Materials MICHAEL CHILCOTE, MEGAN HARBERTS, Department of Physics, The Ohio State University, YU LU, Department of Chemistry, The Ohio State University, HOWARD YU, Department of Physics, The Ohio State University, BODO FUHRMANN, KATRIN LEHMANN, Institute fr Physik, Martin-Luther-Universitt Halle-Wittenberg, ANDREW FRANSON, Department of Physics, The Ohio State University, GEORG SCHMIDT, Institute fr Physik, Martin-Luther-Universitt Halle-Wittenberg, EZEKIEL JOHNSTON-HALPERIN, Department of Physics, The Ohio State University — Here, we present the facile synthesis of a new class of organic-based magnetic nanostructures consisting of nanowires of vanadium tetracyanoethylene ($V[TCNE]_2$) that self-assemble along the ridges of a grooved substrate. These nanowires exhibit uniaxial magnetic anisotropy in direct contrast to the isotropic in-plane response of typical thin-films. Furthermore, the magnetic anisotropy persists to the point of re-coalescence of the nanowires into a thin film, suggesting effects beyond simple shape anisotropy are at work. Moreover, isolated films of the V[TCNE] analog vanadium methyl tricyanoethylene carboxylate show a temperature-dependent switch in the easy axis from in-plane to out of plane, again suggesting underlying effects beyond shape anisotropy. These results introduce a new degree of freedom for organic-based magnetism and spintronics, allowing for the engineering of magnetic anisotropy at nanometer length scales in a material that exhibits both robust room-temperature magnetic order and the benefits of low cost, mechanical flexibility, and facile synthesis found in other organic materials.

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Date submitted: 15 Feb 2017 Electronic form version 1.4