MAR16-2015-008755

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

New Directions for Organic Spintronics: Novel Materials and Emergent Phenomena[1]

EZEKIEL JOHNSTON-HALPERIN, Department of Physics, The Ohio State University

Organic and organic-based materials are attractive candidates for applications in magnetoelectronics and spintronics due to their low cost, ease of fabrication, and low spin-orbit coupling (and consequently long spin lifetimes). However, in comparison to the case for inorganic systems, robust intrinsic magnetic ordering in this class of materials is exceedingly rare and as a result the potential of these materials has yet to be fully realized. Here we present a series of recent breakthroughs in the synthesis, encapsulation, and measurement of organic-based magnets that lay the foundation for all organic magnetoelectronic and spintronic devices. We will discuss advances in encapsulation strategies that allow lifetimes of up to 1 month in air for functional magnetoelectronic devices, the use of ligand substitution to generate a library of related magnetic materials, the growth of all-organic and hybrid organic/inorganic magnetic heterostructures, and measurements of the magnetization dynamics that reveal ferromagnetic resonance (FMR) linewidths of ˜1 G, comparable to or narrower than corresponding measurements in yttrium iron garnet (YIG). These results establish the validity of organic-based magnets for applications in next-generation magnetoelectronics and provide unique leverage on long-standing challenges in the field of organic spintronics. For example, organic magnetic heterostructures promise to provide an exciting opportunity to explore exchange, dynamic spin injection, and spin transport in all-organic spintronic devices.

[1]This work was supported in part by NSF DMR-1507775 and the Center for Emergent Materials (an NSFMRSEC; Award Number DMR-1420451) at The Ohio State University.