

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Magnetic ordering in lanthanide-molybdenum oxide nanostructure arrays JOSEPH HAGMANN, SON LE, National Institute of Standards and Technology, LYNN SCHNEEMEYER, PATTI OLSEN, Montclair State University, TIGLET BESARA, THEO SIEGRIST, Florida State University, DAVID SEILER, CURT RICHTER, National Institute of Standards and Technology — Reduced ternary molybdenum oxides, or bronzes, offer an attractive materials platform to study a wide variety of remarkable physical phenomena in a system with highly varied structural chemistry. Interesting electronic behaviors, such as superconductivity, charge density waves, and magnetism, in these materials arise from the strong hybridization of the 4d states of high-valent Mo with O p orbitals. We investigate a series of molybdenum bronze materials with Lanthanide-Mo₁₆O₄₄ composition that can be described as a three-dimensional array of metallic Mo₈O₃₂ nanostructures computationally predicted to contain a single charge with spin separated by insulating MoO₄ tetrahedra. This study reveals novel magnetic ordering in Lanthanide-Mo₁₆O₄₄ systems arising, not from the inclusion of magnetic elements, but rather from an exchange interaction between cubic Mo₈O₃₂ units. Here, we report the magnetometry and transport behaviors of a series of Lanthanide-Mo₁₆O₄₄ materials, emphasizing an observed low-temperature phase transition signifying the onset of antiferromagnetic ordering between the arrayed nanostructures, and relate these behaviors to their experimentally-characterized structures to reveal the intriguing physics of these correlated electronic systems.

Joseph Hagmann
National Institute of Standards and Technology

Date submitted: 08 Nov 2015

Electronic form version 1.4