MA 32: Magnetic Semiconductors II

Time: Friday 10:15–10:45 Location: H10

Invited Talk MA 32.1 Fri 10:15 H10

Light-Induced Magnetization in Colloidal Semiconductor Nanocrystals — •Gerd Bacher[1], Lars Schneider[1], Remi Beaulac[2], Paul I. Archer[2], and Daniel R. Gamelin[2] — [1]Werkstoffe der Elektrotechnik and CeNIDE, Universität Duisburg-Essen, 47057 Duisburg, Germany — [2]Department of Chemistry, University of Washington, Seattle, USA

Future spintronics and spin-photonics technologies will require a portfolio of techniques for manipulating spins in semiconductor nanostructures. One key ingredient is the magnetic exchange interaction between charge carriers and magnetic impurity ions embedded in the semiconductor. Pulsed laser excitation can thus lead to light-induced spontaneous magnetization. Despite its long history and its actual renaissance due to implications on semiconductor spintronics, weak exchange fields observed in experiment up to now suppose that this kind of light-induced magnetization is a low temperature phenomenon, not suitable for any room temperature application.

Here we demonstrate spontaneous photoinduced polarization of Mn2+ spins in colloidal CdSe nanocrystals [1]. Very large effective internal magnetic fields are observed that lead to complete magnetization of the nanocrystals in the absence of an external magnetic field, with signatures of photomagnetization observable even at or near room temperature. These large spin effects could lead the way to a new generation of room temperature spin-based semiconductor devices.

[1]R. Beaulac, L. Schneider, P.I. Archer, G. Bacher, D.R. Gamelin, Science 325, 973 (2009)