

Physics Colloquium

Michigan Technological University

Tuesday, January 28, 2014

at 11:00 am

Room 139 Fisher Hall



Hybrid Nanomaterials, Control, and Symmetry

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Abstract: In this talk I will outline recent advances and applications of a dynamic fabrication technique capable of producing complex, hybrid, 3D nanomaterials which cannot currently be fabricated via any other method. The advantages of the technique are that a wide range of materials and morphologies can be chosen and combined with one another, the entire process is relatively fast and billions of nanoparticles are concurrently fabricated, and that dynamic control over morphology is achievable, paving way for applications in several branches of nanoscience and nanoengineering. Materials with truly 3D geometries can consist of metals, metal oxides, semiconductors, catalysts, ferromagnetic materials, and materials exhibiting photoconductivity such as TiO₂ obviating the usefulness of the technique. Although the critical dimensions of individual nanoparticles can be pressed to 10's of nanometers, the technique also allows for fabrication of microstructures important in the case for the application of catalytic and magnetic motors. Specifically the applications I will discuss are nanoscale propulsion via chemical and magnetic means, metamaterials and symmetry breaking including chiral plasmonic materials and single domain magnetic particles, as well as self-assembly and chiral separation.

Biography: John Gibbs received his B.S. in Physics/Mathematics and Ph.D. in Physics from the University of Georgia in 2005 and 2011 respectively. Since 2011, he has been a postdoctoral fellow at the Max Planck Institute for Intelligent Systems in Stuttgart, Germany. His research interests include the physics of nanomaterials and a wide range of applications including optical properties of nanostructures, propulsion at the nanoscale including catalytic nanomotors as well as externally-driven magnetic nano-actuators, metamaterials and left-handed materials, chiral nanomaterials, hybrid nanostructures, dynamic light scattering and microscopy techniques, and various other non-equilibrium soft matter systems. He has authored over 15 peer-reviewed articles in leading physics and materials journals and was awarded the AVS National Student Award for the AVS 58th International Symposium and Exhibition in 2011, the Sean M. Kirkpatrick Award for outstanding achievement in graduate research at the University of Georgia in 2011, and the Ground Breaking Contribution Award at the International Conference on Chiroptical Spectroscopy, in Nashville, TN, 2013.

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