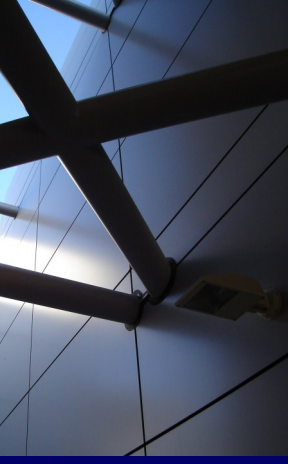

COLLOQUIUM
MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

Student Presentations:

Aleksey Volodchenkov, Ph.D Student
Mechanical Engineering, University of California Riverside

Friday, October 26, 2012
11:10AM-12:00PM
Bourns Hall A265

Synthesis and Characterization of Metal–Oxide Composite Materials for Permanent Magnetic Applications

State of the art magnets depend heavily on the use of rare-earth materials and cost 10 to 20 times more than other magnets such as ferrite magnets, per weight. In addition, the global supply of crucial rare-earth elements is uncertain, causing a real threat to the magnetic industry. Effective use of exchange coupling between hard and soft magnetic materials could decrease reliance on rare-earth based magnetic materials and lower the cost of high performance permanent magnets. Despite the promise, engineering a composite permanent magnetic material with enhanced magnetic properties as a result of exchange coupling has been an elusive goal. Research described in this thesis centers on the synthesis and characterization of metal-oxide 3D bulk composite materials for permanent magnetic applications. Samples were densified from powders using the Current Activated Pressure Assisted Densification (CAPAD) apparatus. A range of samples with densities as high as 97% relative density have been synthesized in relatively short times (~10 minutes). Samples have been shown through X-ray diffraction (XRD) to contain desired composition, and are indeed hard and soft magnetic composites. The applied pressure has been shown to play a significant role in increasing density and in turn improving the magnetic properties. Enhanced magnetic saturation of the composite material, as compared to the mass dominant hard phase has been observed.

Bio: Aleksey relocated from Moscow to Los Angeles in 1998. He received two BS degrees (Aerospace Engineering and Material Science Engineering) in 2010 from UC Irvine and was awarded an MS degree in Mechanical Engineering in summer 2012 from UC Riverside. Aleksey is currently a Ph.D student for Dr. Javier Garay's lab.