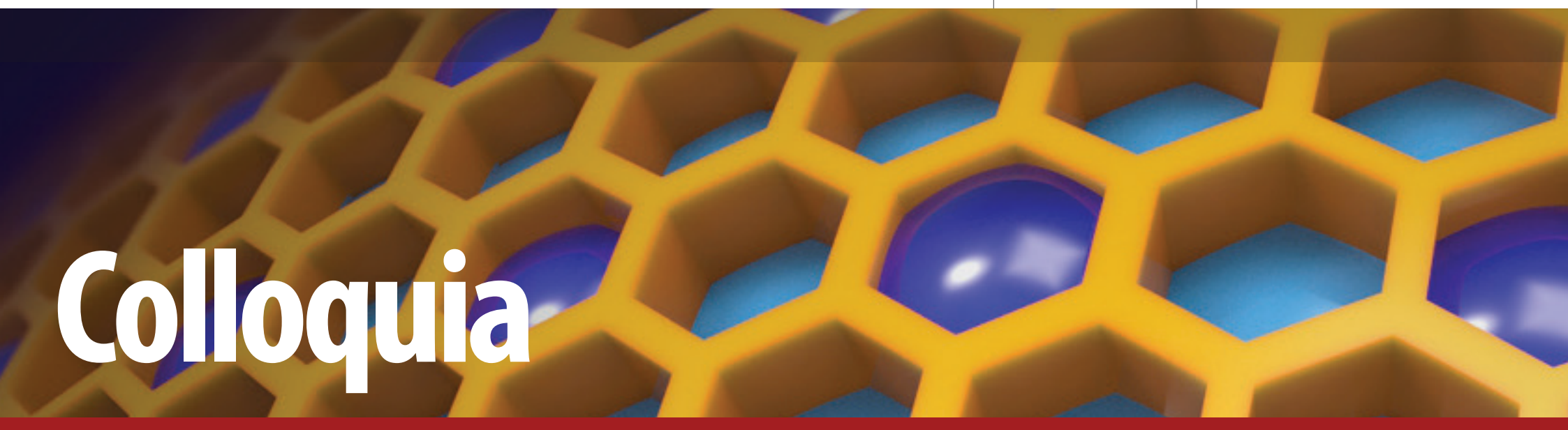
Department of Physics



Colloquia

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SPRING 2016

Taner Yıldırım

NIST Center for Neutron Research,Gaithersburg, MD, USA

High-Capacity Hydrogen/Methane Storage and Carbon Captures in Metal Organic Frameworks (Mof): The Current Progress and Challenges

day	location	time
MAR 30, 2016 WED	EE01	15:40

ABSTRACT

On-board hydrogen/methane storage in fuel cell-powered vehicles is a major component of the national need to achieve energy independence and protect the environment. The main obstacles in hydrogen storage are slow kinetics, poor reversibility and high dehydrogenation temperatures for the chemical hydrides; and very low desorption temperatures/energies for the physisorption materials (MOF's, porous carbons). Similarly, the current methane storage technologies are mainly based on physisorption in porous materials but the gravimetric and volumetric storage capacities are below the target values. Finally, carbon capture, a critical component of the mitigation of CO2 emissions from industrial plants, also suffers from similar problems. In this talk, we discuss our attempts to solve these challenges using a unique combination of computational, synthetic and experimental methods. The main scope of our research is to achieve fundamental understanding of the chemical and structural interactions governing the storage and release of hydrogen/methane and carbon capture in a wide spectrum of candidate materials. We studied the effect of scaffolding and doping of the candidate materials on their storage and dynamics properties. We will review current progress, challenges and prospect in closely related fields of hydrogen/methane storage and carbon capture.

Dr. Taner Yildirim obtained his PhD in Condensed Matter Physics at the University of Pennsylvania during 1990-1994. His PhD work involved combined experimental and theoretical studies of doped fullerenes and quantum magnets under the supervision of Prof. Jack Fischer and Prof. A.B. Harris. He did his postdoctoral work at the University of Maryland and the NIST Center for Neutron Research during 1994-1997. Since 1997, he has been a Physicist at the NIST Center for Neutron Research, working on a large number of problems, both theoretically and experimentally. Recently Dr. Yildirim became an adjunct professor at the Materials Science and Engineering at the University of Pennsylvania. His research addresses structural, magnetic, and transport properties of novel materials with an eye toward practical applications. This is done by calculating the properties of real materials using first-principles computational techniques and testing the results by neutron scattering and other measurements. Systems of particular interest include molecular solids such as the fullerenes and cubane, frustrated magnetic systems such as the Kagome lattice and cuprates, novel superconductors such as doped fullerenes, magnesium diboride and Fe-pnictide, and nanomaterials such as nanotubes and molecular magnets. He has over 130 peer-reviewed publications in the field including several review articles. His work received over 3500 citations. He is a winner of several awards, including 2006 Science Prize of the Neutron Scattering Society of America, 2007 United States Department of Commerce Gold Medal Award, and 2007 Arthur S. Flemming Award. Dr. Yildirim has been named Fellows of the American Physical Society in 2008.

The Physics Colloquia are designed to address a non-specialist, broad audience and introduce topics of contemporary research through lectures by leading experts. We warmly invite all members of the student body, including undergraduates enrolled in any programme.

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