Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina

17 Gennaio 2013, ore 15.30, Aula E. Majorana,
Dip.to di Fisica e di Scienze della Terra,
V.le F. Stagno d'Alcontres 31, S. Agata, Messina

Prof. Steve W. Martin

Anson Marston Distinguished Professor of Materials Science & Engineering

Iowa State University, Ames, IA 50011

Seminar title:

Preparation and Characterization of Fast Ion Conducting Lithium Thio-Germanate Thin-Films Grown by RF Magnetron Sputtering

Abstract

New battery chemistries are being sought to help develop advanced electric propulsion vehicles, advanced microelectronic devices, and to help create load leveling storage technologies for wind and solar energy conversion systems. One particular promising battery chemistry already on the market today is the so-called lithium-ion battery. These systems, while significantly advancing the state of the art in energy and power densities, are presently operating nearly a factor 10 below their theoretical capacities due to the use of carbon-graphite anodes. To break this barrier, the rush is on in many laboratories around the world to develop next generation anode and cathodes. Less work is active on the electrolyte and our research group at ISU for many years has examined highly conducting lithium ion doped sulfide (thio) glasses. In this talk, our most recent work on examining thio-germanate glasses as next generation high conductivity thin-film solid electrolytes will be reported. Extensive work at the ORNL has resulted in the development of the oxy-nitride LiPON lithium thin film solid electrolyte and this material has been the "benchmark" of thin films for lithium batteries because the additional nitrogen in the film not only increases the Li^+ ion conductivity, but it also dramatically improves the interfacial chemical stability of the electrolyte in contact with high capacity lithium metal anodes. In this work, we report on our work to examine thio-materials as replacement for the highly stable, but lower Li^+ conducting LiPON thin films. So far we have obtained thin-films in the $nLi_2S + GeS_2$ series of compositions with n = 1, 2, and 3 which have room temperature conductivities as high as 7×10^{-3} S/cm nearly, 7,000 times higher than that of LiPON. In this talk, I will report on the preparation, compositional determination, structural determination, and Li^+ conductivities of these thin films.