J.A. Woollam Co.
Ellipsometry Solutions

Introduction to Ellipsometry: Theory & Applications

University of New Mexico

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Spectroscopic Ellipsometry (SE) is a non-contact, non-destructive optical technique that measures the change in polarization light upon reflection from a sample. SE can determine the optical properties (index and absorption) of bulk materials and films, as well as measure film thicknesses ranging from less than a single atomic layer to several micrometers. Optical properties can often be correlated to the electronic configuration, temperature, alloy ratio, porosity and other material properties. SE is also very sensitive to surface properties, including surface roughness and contamination.

SE has been used for a wide range of ex situ and in situ applications. They include: semiconducting, optical, and photovoltaic single and multilayer films; lubricants; metal surfaces; attachment of organic molecules to surfaces; self-assembled monolayers; swelling and contraction of polymer brushes and other films; glass transition temperatures; and many others.

In this ~1 hour talk, we will discuss basic ellipsometry theory, instrumentation, modeling and data analysis, and then review some examples of various applications.

After the talk, we will conduct a seminar that focuses on beginning data analysis, using examples of real data. Participants are invited to bring their own laptop computers, so that they can follow along during the data examples using the using the Woollam CompleteEASE® software.

Dr. Tom Tiwald graduated with a Master's degree from the University of Nebraska in 1987, and went to work for Motorola in Austin TX, where he used SIMS and AES to study surface contamination on silicon surfaces. In 1994, he returned to the University of Nebraska to pursue a Ph.D. His research involved applications of infrared ellipsometry in the areas of free carrier, phonon and vibrational absorptions in semiconductors, oxides, oils, polymers and other materials. In 1999 Tom joined the Applications group at the J. A. Woollam Co. Since then, he has been working on a variety of ellipsometric applications, including infrared optical materials, temperature measurements, as well as in situ and web coating process monitoring and control.