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Precision Measurements of Optical Constants Using Spectroscopic Ellipsometry

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ABSTRACT

Design and fabrication of electronic and optoelectronic devices requires an accurate knowledge of optical constants of all materials involved in the device. For fabrication, thickness and properties of device layers need to be characterized. To predict performance of optical devices, we also need to know the optical constants (absorption coefficient and refractive index) of all materials. Spectroscopic ellipsometry has been the metrology method of choice in the semiconductor industry for many years, but current applications only scratch the surface of the potential capabilities of this technique. My talk will describe advanced applications of ellipsometry to semiconductors, metals, and complex metal oxides. I will also discuss how ellipsometry can investigate some basic physics questions, for example: (1) How does the refractive index of a ferromagnet change near the Curie temperature. (2) How do the s-bands in the conduction band of NiO align relative to the upper Hubbard d-band. (3) How does the antiferromagnetic interaction in NiO split the optical phonons?

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BIO:

Dr. Stefan Zollner received his Ph.D. in Semiconductor Physics in 1991 from Universität Stuttgart (Germany) with research performed at the Max-Planck-Institute for Solid State Research. After a postdoctoral position at IBM Yorktown Heights, he accepted a tenure-track faculty position at Iowa State University in 1992. From 1997 to 2010, he held various engineering and management positions at Motorola, Freescale Semiconductor, and IBM related to semiconductor process development (CMOS, BiCMOS, GaAs). Since 2010, he has been Professor and Physics Department Head at New Mexico State University. Dr. Zollner has published over 170 journal articles and given nearly 200 conference presentation. Since 2010, his external research expenditures at NMSU have been over one million dollars. He is an IEEE Senior Member and a Fellow of the American Physical Society.