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A Novel Method to Characterize Nanorod Orientation and Aggregation in Polymer Nanocomposites[1] ETHAN GLOR, ROBERT FERRIER, RUSSELL COMPOSTO, ZAHRA FAKHRAAI, Univ of Pennsylvania — Gold nanorods provide an ideal system for the systematic change of optical properties through changes in the rod aspect ratio. Furthermore, the dispersity and orientation of the nanorods within a polymer matrix greatly affects the optical properties of the composites. Here, we use spectroscopic ellipsometry to characterize the properties of nanocomposite thin films. The optical properties of the nanorod are modeled as an effective index of refraction for a disordered meta-material. This effective medium index is then related to the longitudinal surface plasmon resonance (LSPR) of the nanorods. The degree of birefringence in the LSPR frequency, as determined by variable angle ellipsometry measurements, can help determine the average orientation of the rods in the thin film as well as the degree of aggregation. With this method, one can quickly and accurately define the average orientation and average aggregation of nanorods within a nanocomposite with a single measurement. Ellipsometry also allows us to perform *in-situ* variable temperature measurements to monitor properties such as nanoparticle shape and the glass transition temperature of the matrix.

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