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High-Resolution Light Transmission Spectroscopy of Nanoparticles in Real Time[1] CAROL TANNER, NAN SUN, ALISON DEATSCH, FRANK LI, STEVEN RUGGIERO, University of Notre Dame — As implemented here, Light Transmission Spectroscopy (LTS) is a high-resolution real-time technique for eliminating spectral noise and systematic effects in wide band spectroscopic measurements of nanoparticles. In this work, we combine LTS with spectral inversion for the purpose of characterizing the size, shape, and number of nanoparticles in solution. The apparatus employs a wide-band multi-wavelength light source and grating spectrometers coupled to CCD detectors. The light source ranges from 210 to 2000 nm, and the wavelength dependent light detection system ranges from 200 to 1100 nm with 1 nm resolution. With this system, nanoparticles ranging from 1 to 3000 nm diameters can be studied. The nanoparticles are typically suspended in pure water or water-based buffer solutions. For testing and calibration purposes, results are presented for nanoparticles composed of polystyrene and gold. Mie theory is used to model the total extinction cross-section, and spectral inversion is employed to obtain quantitative particle size distributions. Discussed are the precision, accuracy, resolution, and sensitivity of our results. The technique is quite versatile and can be applied to spectroscopic investigations where wideband, accurate, low-noise, real-time spectra are desired.

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