Abstract Submitted
for the TSF10 Meeting of
The American Physical Society

**Using Spectroscopic Ellipsometry to Distinguish Between Si and SiO2 Nanoparticles** JUSTIN FRASIER, GREGORY SPENCER, ANUP BANDYOPADHYAY, WILHELMUS GEERTS, Texas State University-San Marcos — Silicon-based nanoparticles have been synthesized by annealing a thin layer of Si ($\sim$ 10 nm) that was deposited upon thermally-oxidized silicon wafers. Samples were annealed at various temperatures (600 to 900 $^{\circ}$C) in UHV and by RTA in flowing Ar to study the particle size distribution dependence on process parameters. Typical particle sizes measured by AFM ranged from 100 to 250 Å. Particle densities up to 50% were observed. Nondestructive spectroscopic ellipsometry was utilized through effective medium approximations (EMA) to determine whether or not the resulting nanoparticles were pure Si, a Si core with oxide shell, or fully oxidized. EMA analysis is based upon the models proposed in the Lorentz-Lorenz (LL), Maxwell-Garnett (MG), and Bruggeman methods. These allow the estimation of the the optical constants ($N_e$) of an inhomogeneous material as a weighed average (f) of the optical constants of its constituents ($N_1$, $N_2$, $N_h$). The experimental AFM data and modeling software was used to calculate the optical spectra of the samples assuming various oxidized states of the nanoparticles. The oxidized state of the particles appears to cause distinct features in the optical spectra. The results of these analyses will be discussed.

Justin Frasier
Texas State University-San Marcos

Date submitted: 18 Oct 2010 Electronic form version 1.4