

Optical Coherence Correlation Spectroscopy (OCCS)

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A classical technique to monitor dynamical processes at the molecular level is fluorescence correlation spectroscopy (FCS). FCS requires fluorescent labels that are typically limited by photobleaching and saturation. We present a new method that uses noble-metal nanoparticles instead of fluorophores: optical coherence correlation spectroscopy (OCCS). OCCS is a correlation spectroscopy technique based on dark-field optical coherence microscopy, a Fourier domain optical coherence tomography technique. In OCCS, several sampling volumes are measured simultaneously with high detection sensitivity. OCCS measures the time correlation function of the light back-scattered by the nanoparticles. Using a mode-locked Ti:Sapphire laser (780nm central wavelength) we performed first experiments with different nanoparticles down to 30nm in diameter. We present experimental results and a preliminary model to fit the correlation curves and extract the particles' concentrations and diffusion coefficients. The experimental determination of the diffusion times of gold nanoparticles using this model is presented, showing the potential of our method. In the near future, we aim at investigating smaller gold nanoparticles that interfere less with the biological phenomena under study.