Depolarized Dynamic Light Scattering Study of Polymer Grafting on Gold Nanorods

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Polymer-grafted gold nanorods are a subcategory of particle grafted nanoparticles which consist of a gold nanorod (AuNR) core and polymer canopy. They are particularly useful in sensing technology, imaging, and cancer therapeutics because of their high biocompatibility. This experiment aims to understand the effectiveness of depolarized dynamic light scattering (DDLS) as a method for the characterization of AuNRs. Because of the complications of other procedures in measuring nanorods, DDLS was chosen because of its non-invasive nature and accuracy in determining the properties of small particles. This project analyzes data from DDLS with bare and 10 kDa poly(ethylene glycol) (PEG) grafted AuNRs from experiments run at Institute 1 and Institute 2. Data from these two setups with different wavelengths was analyzed using a multi angle DLS setup, which finds the decay rates from the vertical-vertical (VV) and vertical-horizontal (VH) polarized correlation functions. These decay rates can be related to the translational and rotational diffusion coefficients through the results from the Scattering Theory for Shorter Cylinders. The dimensions of the nanorods were determined using De La Torre and Glidden's straight cylinder models. The results show a significantly larger diameter and relatively unchanged length after grafting which is consistent with expectations.

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