

- 1) Adrienne Chabot
- 2) Prof. Steve Ruggiero and Prof. Carol Tanner
- 3) Development of laser transmission spectroscopy as a bio-molecular detection system

My work this summer used the new technique of Laser Transmission spectroscopy for the analysis of nanoparticles. Polystyrene nanosphere is the one type of nanoparticle used this summer. Polystyrene beads are microspheres of a precise size within a known standard deviation. These beads provide an easy way to check the precision of the LTS prototype. We can compare the size and density measurements from the LTS prototype with the manufacturer's precise density and size information of the polystyrene beads. Using the comparative precisions of the LTS at varying densities of differently sized beads, we can determine the optimal density range of a particle of a certain size. This information will help in deciding the densities needed for new particle measurements.

Bovine serum albumin (BSA) is a stable and soluble plasma protein with an ellipsoid structure. This particle was studied because of its relative abundance and its similarity in structure to other proteins. Our preliminary study of BSA should facilitate future measurements of proteins similar in size and structure.

Using our LTS technology, we can take measurements that give the number of objects in solution that present as separate particles, and the diameter distribution of the nanoparticles. For the materials used in these studies, useful information was not previously available due to the limited resolution of other measuring techniques, and/or their ability to provide density distribution information.

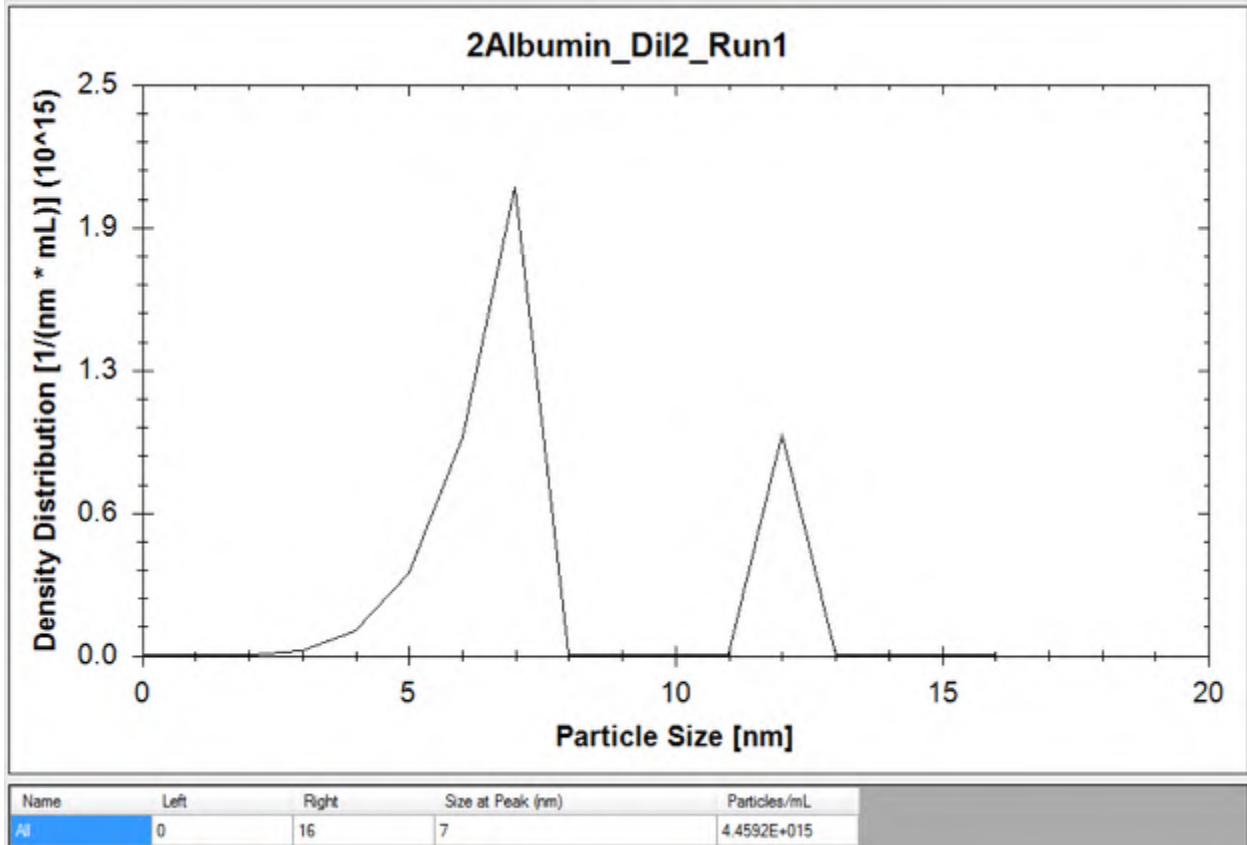


Figure 1. Albumin diluted to a calculated density of 6.022×10^{15} mol/mL. Albumin is expected to be an ellipsoid with either a 5-6nm diameter and either an 11, or 8.5nm length. The peaks from the LTS measurements strongly suggest a 7nm diameter and an 11nm length.

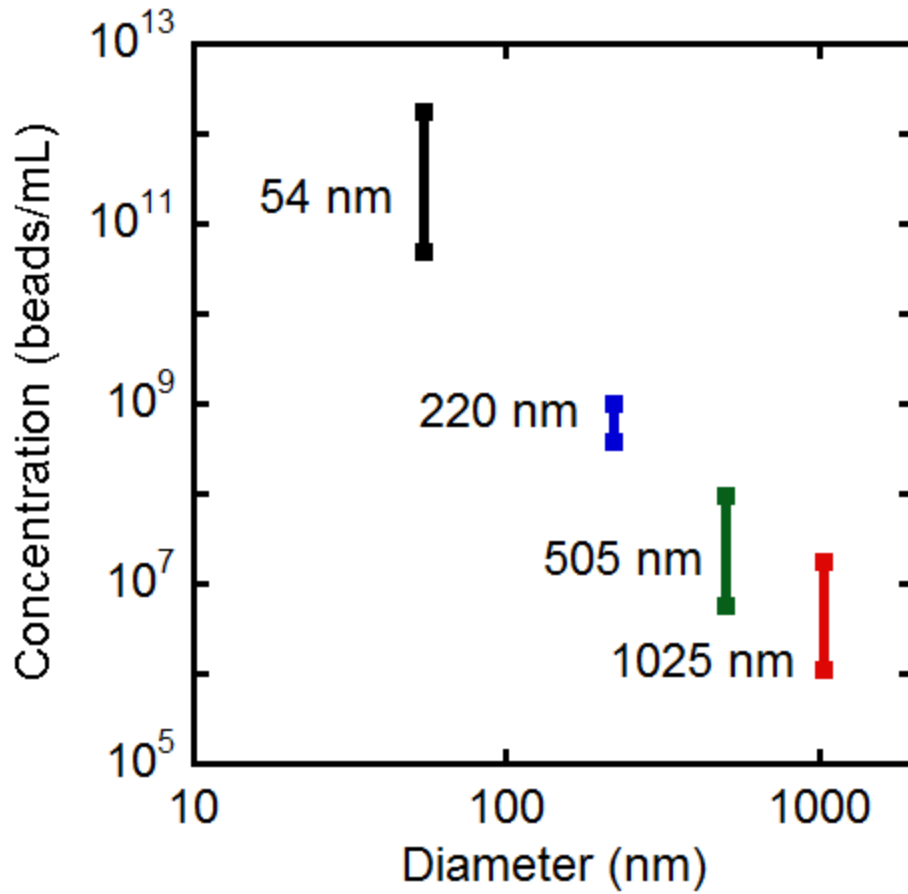


Figure 2. Acceptable concentration ranges for Polystyrene beads. The x-axis shows the diameter of the beads being measured. The y-axis shows the concentration at which the beads were measured. The colored bars show the concentration for each bead size that gave the most stable results.