Particle Surface Analysis
Near Field Light Scattering to Analyze Nanoparticle Coatings

Key Features
Measure Individual Particle Surfaces
Operate in Particle's Native Environment
50 nm to 2 μm
Background

Importance of Surface Properties
As a particle's size decreases, the importance of its surface properties increase. At nanoparticle scales, much of their overall behavior is determined by surface properties, yet there are virtually no techniques that can accurately measure the state of a particle’s surface. Whether a new batch of particles will aggregate after 2 weeks, stick to a glass container surface, enter an epithelial cell, wind up at a tumor site, or accumulate a layer of proteins on its exterior, all depends on the particles' surface properties. The increased use of nanoparticles and their application in fields such as medicine, electronics, batteries, and household products creates an even greater need for an improved method of analysis.

How the NanoTweezer Enables New Surface Insights
To yield nanoparticle dispersions with both chemical and colloidal stability, a thorough evaluation of these surface properties is essential. An improved method to analyze nanoparticle surfaces and learn about interfacial forces has been revolutionized by the NanoTweezer. The main concept is simple, and the system answers one question: how much energy does it take to push a nanoparticle down onto a surface? Well stabilized particles will repel each other (otherwise they’d aggregate). They'll also repel from any surface that mimics their own. These particles will be difficult to push down onto such a surface. Poorly stabilized particles, on the other hand, will be easier to push. The same concept holds true for any particle surface interaction: hydrophilic, steric, electrostatic, etc.

Waveguide Measurements
The NanoTweezer uses the unique waveguide-based technology commercialized by Optofluidics. This novel technology uses a laser to push particles along the surface of a waveguide and measures surface interactions between the particle and the waveguide. The waveguide surface can be engineered with special coatings, depending on what surface interaction is important.

Key Benefits
- The NanoTweezer can measure individual particle surface properties
- Can probe a variety of different surface interactions (charged, steric, etc.)
- Operates in the particle’s native environment
- Measurement sensitivity in the piconewton range
- Can operate on a wide variety of particle material types
- Can operate on particles from 50 nm up to 2 μm

Potential wells can be determined from the intensity histograms of each particle. Surface energy plots can be extracted by removing the optical component of the potential well. For this particular case, the particle required relatively little energy to get about 80 nm from the surface (red arrow). After this point, much more energy is required to “push” the particle closer.