Upconversion Nanomaterial Characterization

Advances in nanoparticle synthesis and modification have led scientists and researchers to use photon upconversion (UC) to create a more stable nanomaterial. Upconversion nanoparticles (UCNPs) emit a low wavelength signal after excitation with a longer wavelength.

UCNPs are most commonly used in photovoltaics, biosensors, and deep tissue targeting agents. UCNPs increase photovoltaic cell efficiency and specificity of analyte detection while reducing photo damage to biological samples.

The CytoViva Hyperspectral Microscope System can optically image, spectrally detect, and characterize upconversion nanoparticles. Figure 1 is a high resolution spectral image taken with reflected broadband illumination showing the morphology of the particles arranged on substrate. Figure 2 is a high resolution spectral image taken with 980nm laser excitation. The bright green areas are large aggregates of UCNPs.

Figure 1: Broadband halogen hyperspectral image of UCNPs in grid pattern

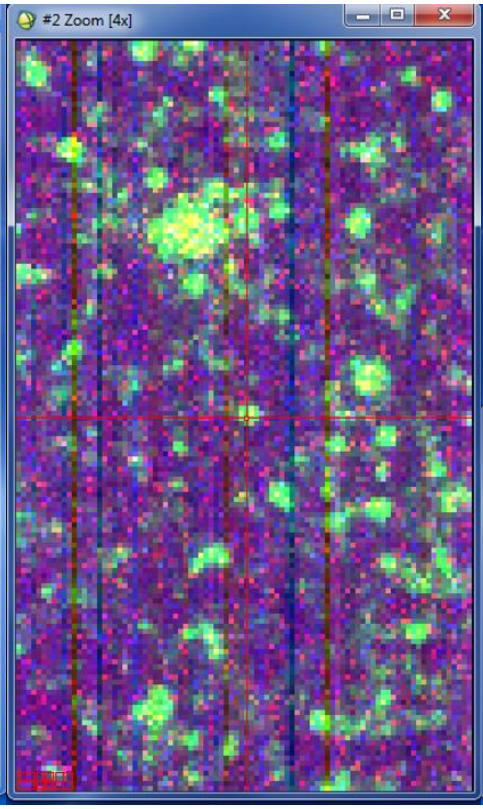

Figure 2: 980 nm laser excitation hyperspectral image of UCNPs in grid pattern

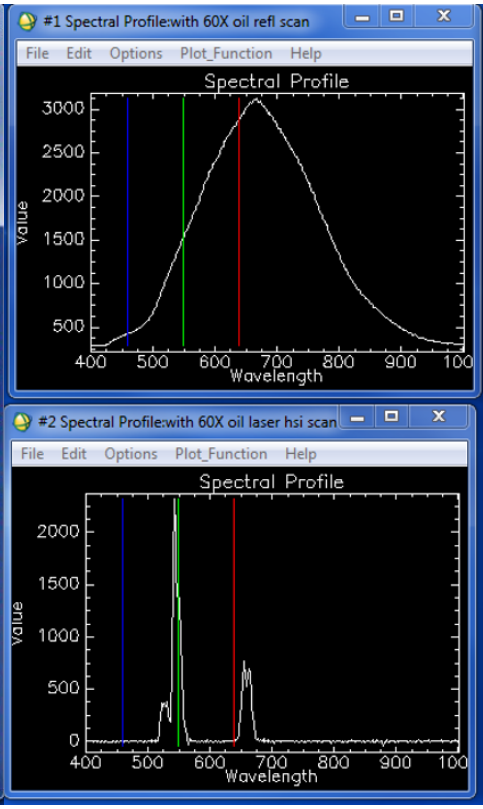

Figure 3: Spectral Response with Halogen Lamp (top) and 980 nm laser excitation (bottom).

Figure 3 is a comparison of the spectral responses of broadband illumination and 980nm laser excitation.The top spectral curve illustrates the spectral response of UCNPs when illuminated with a halogen lamp with no lamp correction utilized. The bottom spectral curve illustrates the spectral response of UCNPs when illuminated with a 980nm laser excitation. Narrow emission spectra is measured at 520nm, 545nm and 660nm and can be easily identified in the spectral response of the laser excited sample.

Using the CytoViva Hyperspectral Microscope technology, scientists can optically image, spectrally detect, and characterize UCNPs in a variety of matrices.

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