Whether supporting the development of fluorescent nanoparticles for photovoltaics research or gold nanoparticles for photothermal therapy, hyperspectral microscopy has evolved into a highly versatile imaging and spectral analysis instrument. One significant advantage of hyperspectral microscopy is its ability to provide images and optical spectral data from every pixel of an image without any special sample preparation of the nanoparticles or environment in which they are integrated. This includes a wide range of nanoparticles used in biological and materials based environments.

An example of the versatility of CytoViva's hyperspectral imaging in nanotechnology research is its ability to easily capture images and spectral data of distinctly different types of nanoparticles including those producing different types of fluorescence emission and plasmonic scatter.

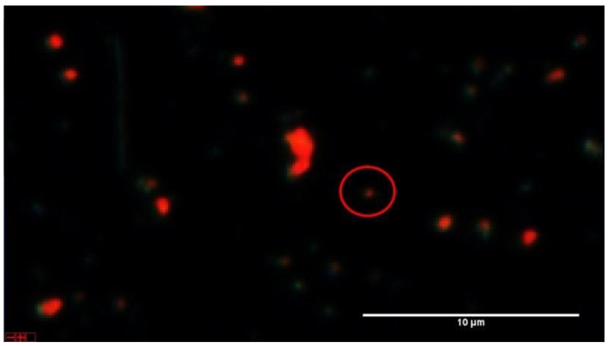

Figure 1: Perovskite fluorescent nanocrystals on a glass slide

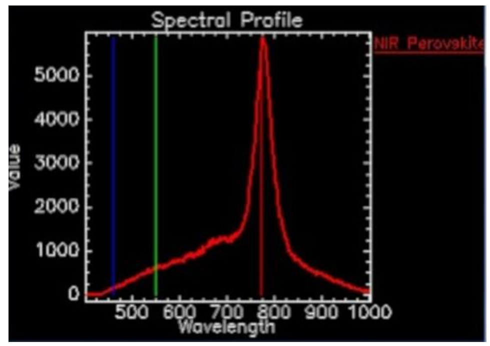

Figure 2: Emission spectrum of Perovskite nanocrystal area circled red in figure 1.

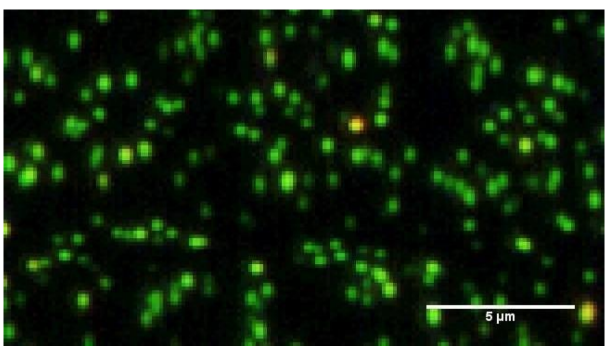

Figure 3: 50nm AuNPs on a glass slide.

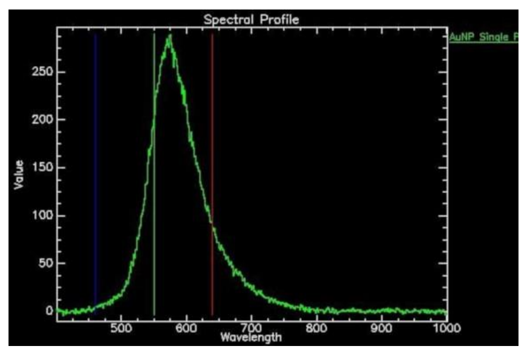

Figure 4: Plasmon resonance based spectral response of the AuNPs.

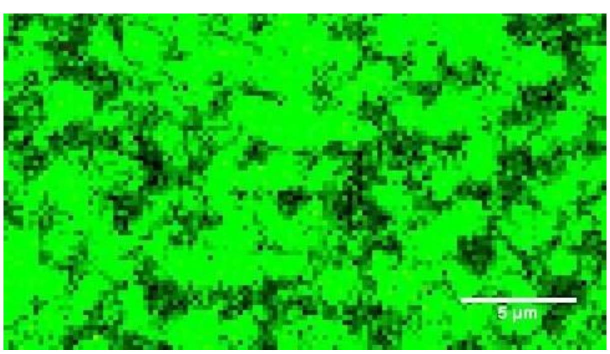

Figure 5: Upconverting NPs on a solid surface substrate.

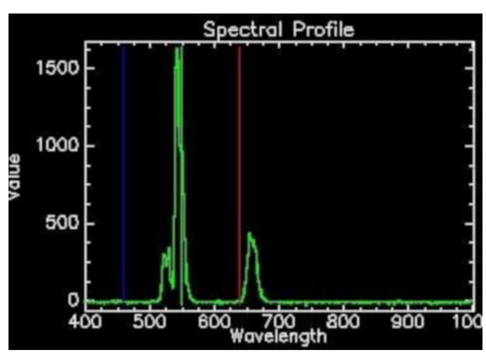

Figure 6: Emission spectrum of upconverting NPs.

Shown above in figure 1 is a hyperspectral image of Perovskite crystalline nanoparticles producing fluorescence emission in the NIR at 760nm. These materials appear as red in the image as the red image filter was moved to the 760nm peak wavelength in the image analysis software. This image was captured using a VNIR (400nm-1,000nm) hyperspectral microscope system equipped with CytoViva's patented enhanced darkfield optics, broadband halogen illumination and a 60x oil iris objective. The crystalline fluorescent nanoparticles are excited by the halogen lamp and produce an emission spectra with a narrow full width half maximum (FWHM). The spectral response characteristics of these fluorescent crystalline nanoparticles are shown in figure 2 above. The red circle in the image indicates the nanoparticle where the spectrum was taken.

Using the exact same system configuration, hyperspectral images of 50nm AuNPs were then captured. The images and spectral response characteristics of these nanoparticles are shown in figures 3 and 4 respectively. These materials produce a repeatable spectral response at 550nm due to the plasmon resonance produced by the sample.

The versatility CytoViva's hyperspectral microscopy is further demonstrated in its ability to use different illumination-excitation sources for unique types of nanoparticles. Figure 5 is an image of rare earth-doped upconverting nanoparticles on a solid surface substrate. For this image a 980nm laser excitation source is required to excite these nanomaterials, which then produce very sharp emission spectrum with peaks at 545nm and 660nm. These particles appear as green areas in the hyperspectral image. The spectral response characteristics for these nanoparticles are shown in figure 6 above. This optical microscopy configuration for this example also includes a reflectance illumination capability with a dichroic mirror and short pass filter in a filter cube system.

These are just a few of the nanomaterial research applications that can be advanced with CytoViva's hyperspectral microscopy. To learn how hyperspectral microscopy can advance your nanoparticle research efforts, please contact us at info@cytoviva.com. We have over a decade of experience supplying hyperspectral microscopy systems in nano-research laboratories worldwide. We will be pleased discuss your research and to arrange to test image your samples at our lab or on-site at your facility if appropriate.