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Product Information

Sunstone® Upconverting Nanocrystals UCP 538, Avidin Conjugated

Catalog Number **75207**
Storage Temperature 2–8 °C

TECHNICAL BULLETIN

Product Description

Sunstone® Upconverting Nanocrystals (UCP) are a novel and proprietary class of rare earth doped nanoparticles of small size, high quantum efficiency, and high photoluminescent intensity that have been functionalized for use in industrial and life sciences applications. UCP are synthesized using specific compositions of individual rare earths and other host elements ($NaYF_4$). Ytterbium serves as the element that initially absorbs the electromagnetic radiation, while other rare earths, such as erbium, holmium and thulium, serve as the emitting elements at the center of the crystal.

Upconversion luminescence is based on the absorption of two or more low-energy (longer wavelength, typically infrared) photons by a nanophosphor crystal followed by the emission of a single higher-energy (shorter wavelength) photon. This is a unique process and does not occur in nature.

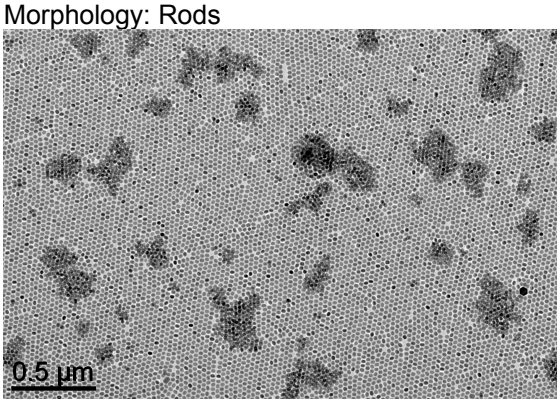
Upconverting materials have been used in a broad variety of life science applications, including:[1,2]

- Immunohistochemistry
- Immunocytochemistry
- Multiplex immunoassays
- Nucleic acid microarrays
- *In vivo*, *in situ*, and *ex situ* biomedical imaging
- Flow cytometry
- Enzymatic assays
- Fluorescence resonance energy transfer (FRET) bioanalytical assays

As a general guideline in existing procedures using avidin-FITC, the suggested starting concentration for the avidin-nanocrystal is 50% of the avidin-FITC concentration. Optimization of the application will be necessary.

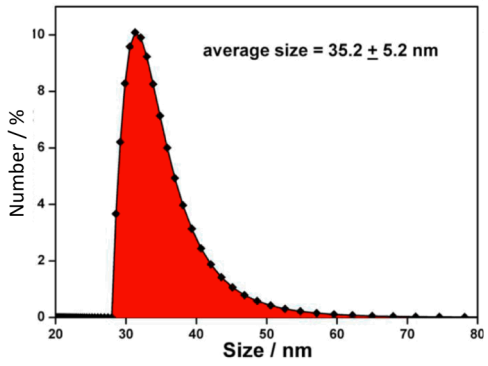
Properties of Sunstone Upconverting Nanocrystals UCP 538, Avidin Conjugated:
Physical form: Lyophilized powder
Excitation maximum: 976 nm
Emission maximum: 538 nm (see Figure 3)
Diameter: 40±15 nm
Functionality: Avidin
Crystal Host: Sodium Yttrium Fluoride ($NaYF_4$)
Activators: Ytterbium (Yb), Holmium (Ho)
Crystal Formula: $NaYF_4$, Yb, Ho
Stabilizer: PEG

Figure 1.
Morphology: Rods



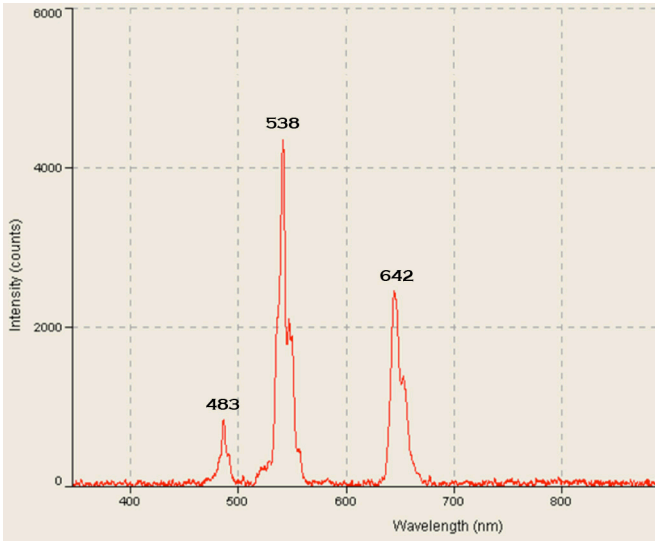
Transmission electron microscope (TEM)

Figure 2.
Crystal Size: ≤40 nm



Dynamic Light Scattering (DLS)

Figure 3.
Emission peak: 538 nm



Precautions and Disclaimer
This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

Preparation Instructions
Nanocrystals can be suspended directly in water at desired concentration for use. Prior to use sonicate the stored stock suspensions to disperse the nanocrystals.

Storage/Stability
Store the product at 2–8 °C.

After preparation, store stock suspensions for 4–6 weeks at 2–8 °C. Do not freeze suspensions of nanocrystals.

Results
Instrumentation Recommendations
The following are representative of instruments suitable for near-IR upconversion phosphorescence using Sunstone Upconversion Nanocrystals, but is not meant to be an all-inclusive list of instruments.

Spectrometers
- Cary Eclipse fluorescence spectrophotometer (Agilent Technologies, USA) with a standard R928 red-sensitive photomultiplier (Hamamatsu Photonics, Japan) was equipped with IR laser diode module C2021-F1 (Roithner Lasertechnik, Austria). An IR laser diode module and a long-pass filter glass RG-850 (Andover Corporation, USA) was mounted to a cuvette holder of the spectrophotometer. Emitted light was collected using bio/chemiluminescence mode of the spectrophotometer from 350–850 nm.[3]
- Fiber-optically coupled USB4000 fluorescence spectrometer (Ocean Optics, USA) using an external continuous-wave laser centered at ~980 nm as the excitation source (Dragon Lasers, China).[4]

Benchtop Scanner
- 96-well FluoroCount multiwell plate reader (Perkin Elmer, USA) modified with an external 980 nm 1.2 W IR laser (Oclaro, USA).[2]

Microscopes
- Inverted fluorescence microscope (Leica Microsystems, Germany) equipped with a 980 nm NIR laser and a Nikon digital camara.[5]
- Epifluorescence microscope (Leica Microsystems, Germany) modified with a 980 nm light from a xenon XBO 75 W lamp.[2]
- Olympus microscopes using 975 diode laser (QPhotonics LLC, USA); with a laser diode driver; Thorlabs LDC 30 65 – 488. Detection: xy translation monitored filter coupled; Ocean Optics, USB 4000

In vivo Imaging
- Maestro *In vivo* spectral imaging system (CRI Inc., USA) equipped with a 980 nm diode laser excitation source (B&W TEK Inc., USA).[6]

Other Possible Excitation Laser Sources

- JDSU 3000 series 660 mW Fiber Bragg grating stabilized 976±1 nm pump module (PN 30-7602-660).
- Edmund Optics Fiber Laser 976 nm 450 mW (PN NT62-688)
- Newport LD Module, 980 nm, 220 mW, CW – (Model: LQC980-220E)

References

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