

SIZE RANGE: 750nm – 150µm

The largest fluorescent particle sizes Adámas offers span from approximately the 1 µm range to the 150 µm range (Figures 1-5). We provide the following sizes : ~1 µm (approx. 750 nm peak via DLS, Figure 1), 15 µm, and 150 µm. Particles emitting in red (due to NV centers) and green spectral ranges (due to NVN centers) are available for 1 µm product (Figure 3).

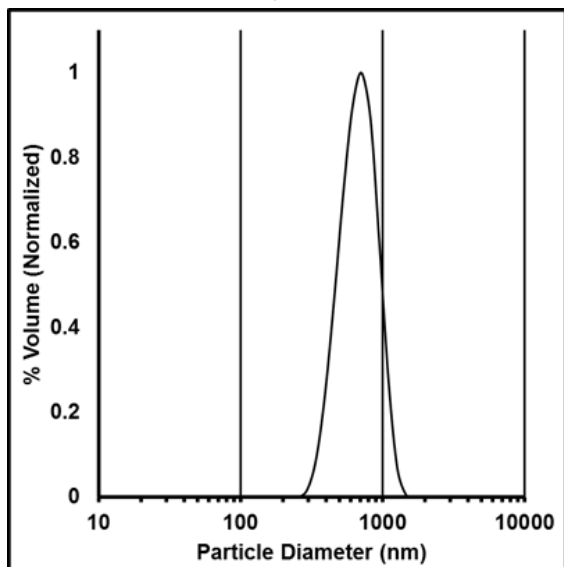


Figure 1: Volumetric particle size distribution of 1µm particles as measured with dynamic light scattering on a Malvern Zetasizer Nano ZS (Malvern Instruments, Ltd. UK). Volumetric peak position is close to 750nm.

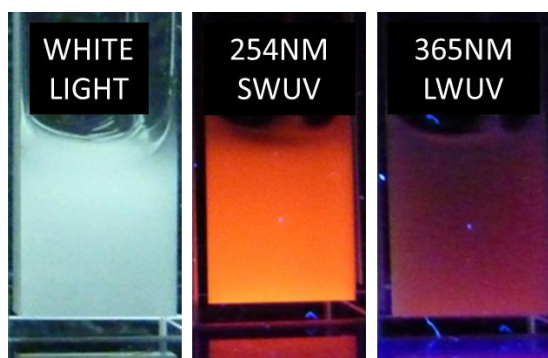


Figure 2: Fluorescence of 1µm-Hi suspensions in water (in quartz cuvettes) observed under excitation with UV lamp under Short-Wave UV (SWUV) and Long-Wave UV (LWUV) mode. Transition from orange to red fluorescence results from the prevalence of NV⁰ emission under SWUV and NV⁻ emission under LWUV.

Particles in this size range exhibit very high fluorescence that can be easily seen under a standard UV lamp (Figures 2, 4). This is different from nanosized particles, where the very high scattering efficiency of the particles limits their ability to have observed fluorescence (visible with the naked eye) under UV lamp excitation.

Note that the absorption extends all the way into the UV region. The distinction between the negatively charged NV⁻ and neutral NV⁰ centers becomes quite noticeable. The NV⁰ center can absorb photons all the way to ~250 nm and below, with a possibility of excitation across the band gap. Because the absorption spectra of NV⁰ and NV⁻ overlap, it is possible for the NV⁰ center to subsequently excite the NV⁻ center. For particles containing higher amounts of NV⁰, they will exhibit strong fluorescence under both LWUV and SWUV excitation. Particularly high fluorescence can be observed under SWUV, where the concomitant excitation of NV⁻ via NV⁰ is observed.

Commercial 750 nm, 15µm, and 150µm particles contain NV⁻ concentrations on the order 2-3 ppm based on EPR characterization.

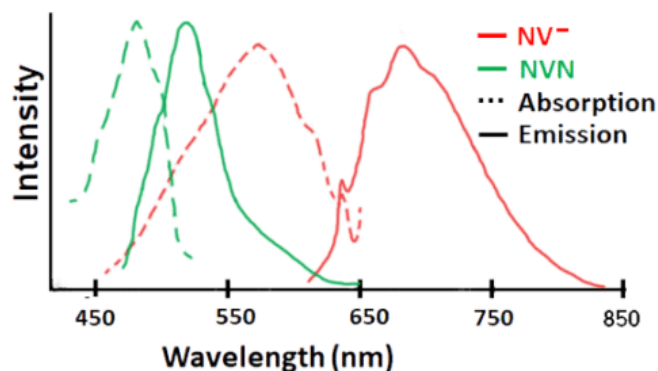


Figure 3: Absorption and emission spectra for particles with green (NVN centers) and red (NV⁻ centers) luminescence, correspondingly.



Surface Chemistry:

15 μm , and 150 μm particles are provided with primarily amphoteric surface functional groups (carboxylic acids, alcohols, etc.), while 1 μm are carboxylated. We also offer specifically functionalized products, such as reduced surfaces (exhibiting $-\text{OH}$ functionalities) or bio-functional varieties such as streptavidin and biotin. Reduced diamond tends to exhibit positive zeta potential. Naturally, due to their sizes, 15 μm , and 150 μm particles lack colloidal stability. Contact us if you would like to discuss your specific functionalization schemes at info@adamasnano.com.

DISCLAIMER: Product characteristics, specifications, costs, part numbers, and all other details are accurate as of the date of preparation of this document. These values are subject to change. Product characteristics are subject to batch to batch variability and improvements in processing or other developments.

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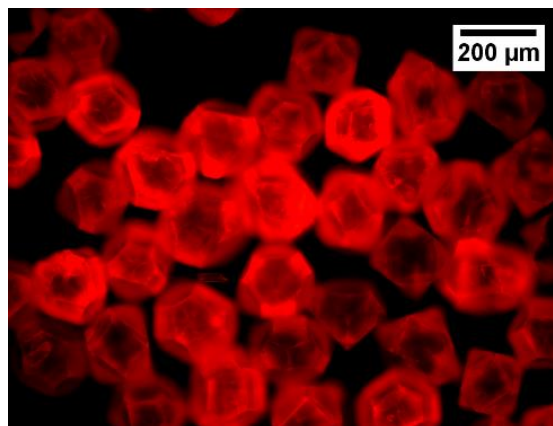


Figure 4: Microscopy images of 150 μm diamond particles containing NV centers under green excitation (517nm/20nm).

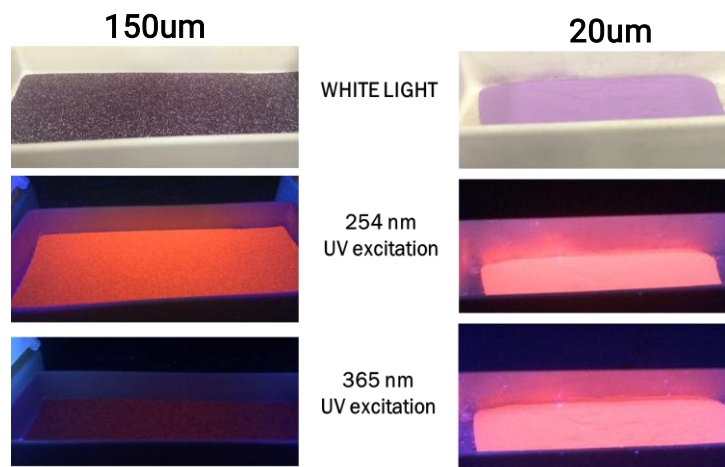


Figure 5: Fluorescence emission under SWUV and LWUV for 150 μm and 20 μm fluorescent diamond particles.

Size	Description	SKY
750 nm Avg	Red Carboxylated 1mg/ml 10ml Green Carboxylated 1mg/ml 10ml	MDNV1umHi10mg MDNVN1umHi10mg
15um	Red FL Powder	MDNV15umHi50mg MDNV15umHi1g
150um	Red FL Powder	MDNV150umHi50mg MDNV150umHi1g

* Products contain 2.5-3ppm of NV- centers as measured by EPR.

**If you require a specified solvent, or have a specific preference for powder or water, please contact us to discuss your requirements.

Patents related to our products: US 9,889,076

