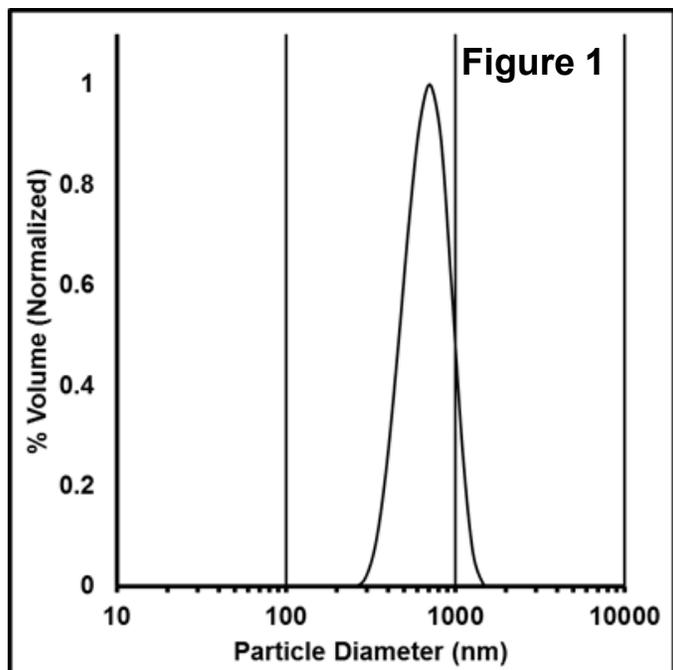
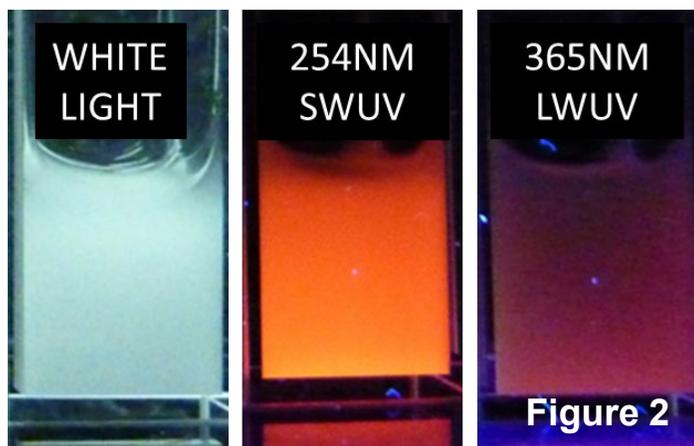


SIZE RANGE: 700nm – 150µm

The largest fluorescent particle sizes Adámas offers are those ranging from approximately the 1µm range to the 150µm range. We provide the following sizes (Figure1-3): 1µm (approx. 700 nm via DLS, Figure 1), 15µm, and 150µm. Naturally, due to their sizes, these particles lack colloidal stability, and may be too large for traditionally cellular applications; however, these particles are well suited for applications where high brightness and signal are required (e.g. authentication, forensic science).



(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 mode position is closer to 700nm.



Particles in this size range exhibit very high fluorescence that can be easily seen under a standard UV lamp (Figure2,3). For smaller particles, the very high scattering efficiency of the particles limits their ability to have observed fluorescence (visible with the naked eye) under UV lamp excitation.

Because these are bulk diamond crystals, it is important to note that the absorption extends all the way into the UV region. The distinction between the NV<sup>-</sup> and NV<sup>0</sup> becomes important. The NV<sup>0</sup> center can absorb all the way to ~250 nm and below, where the defect band gap is located. Because the absorption spectra of NV<sup>0</sup> and NV<sup>-</sup> overlap, it is possible for the NV<sup>0</sup> center to subsequently excite the NV<sup>-</sup> center. For particles containing higher amounts of NV<sup>0</sup>, 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<sup>-</sup> via NV<sup>0</sup> is observed.

Commercial 1µm, 15µm, and 150µm particles contain NV<sup>-</sup> concentrations on the order 2- 3 ppm based on EPR characterization.

(Figure 2) : Fluorescence of 1µm-Hi suspensions in water (in quartz cuvettes) observed under excitation with UV lamp under ShortWave UV (SWUV) and Long-Wave UV (LWUV) mode. Transition from orange to red fluorescence results from the prevalence of NV<sup>0</sup> emission under SWUV and NV<sup>-</sup> emission under LWUV.



Fluorescence emission spectra for the micron size range of particles are essentially the same as for the large size range particles, with the only differences being the significantly higher intensity overall, and, in some cases, more pronounced ZPLs.

### Surface Chemistry:

All products featured in this document exhibit primarily amphoteric surface functional groups (carboxylic acids, alcohols, etc.) with negative zeta potential. We offer more specifically functionalized products, such as reduced surfaces (exhibiting –OH functionalities) or bio-functional varieties such as streptavidin and biotin. Reduced diamond tends to exhibit positive zeta potential. Diamond offers a rich surface for a variety of surface functionalization schemes. Contact us if you would like to discuss your specific functionalization schemes at [info@adamasnano.com](mailto: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.

Figure 3

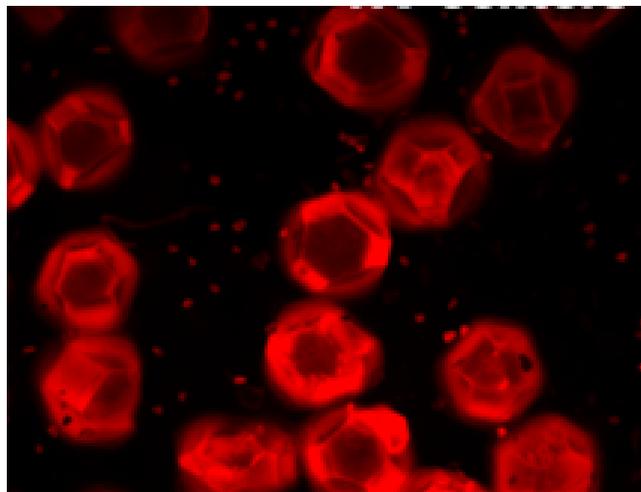


Figure 3: Images of 150 μm diamond particles containing NV centers under green excitation.

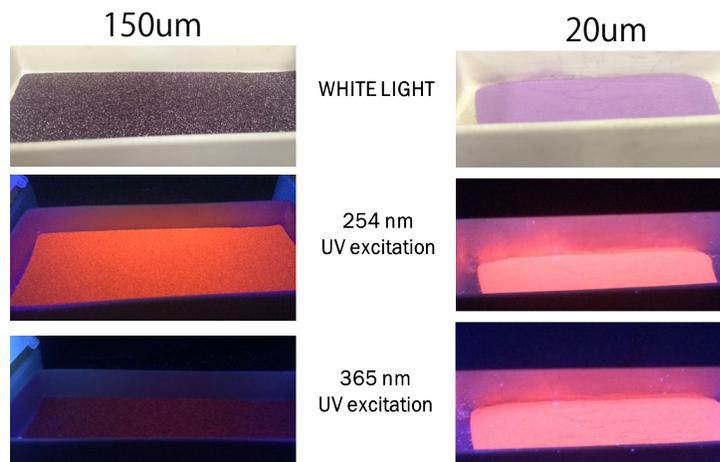


Figure 4: Fluorescence emission under SWUV and LWUV for 150 μm and 20 μm fluorescent diamond particles.

| Micron Range | 1um-Hi   | Powder | MDNV1umHi50mg<br>MDNV1umHi1g     |
|--------------|----------|--------|----------------------------------|
|              | 15um-Hi  | Powder | MDNV15umHi50mg<br>MDNV15umHi1g   |
|              | 150um-Hi | Powder | MDNV150umHi50mg<br>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,

