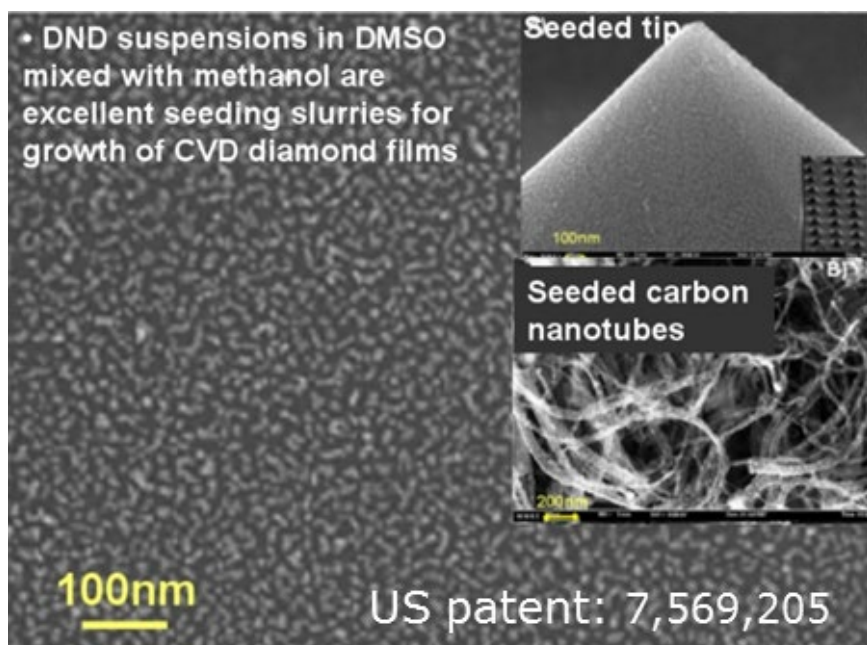


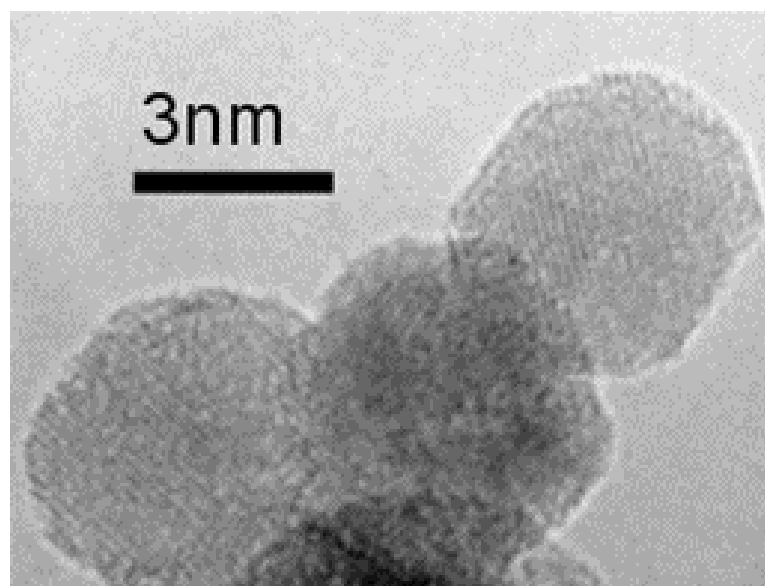
## Detonation Nanodiamond Seeds

Since its development in the 1980s, Chemical Vapor Deposition (CVD) growth of thin film diamond has found an abundance of uses in the microelectronic and tooling industries. Whether the incredible dielectric or mechanical properties of diamond are desired, Adámas's patented seeding suspensions offer the core particles required to grow dense, defect free films of thin diamond on both 2D and 3D substrates (Fig.1), utilizing detonation synthesized nanodiamonds (Fig.2).



*Figure 1: Various substrates seeded using detonation nanodiamond suspensions. Substrates include a silicon wafer (2D substrate), a field tip array (3D), and nanodiamond coated carbon nanotubes.*

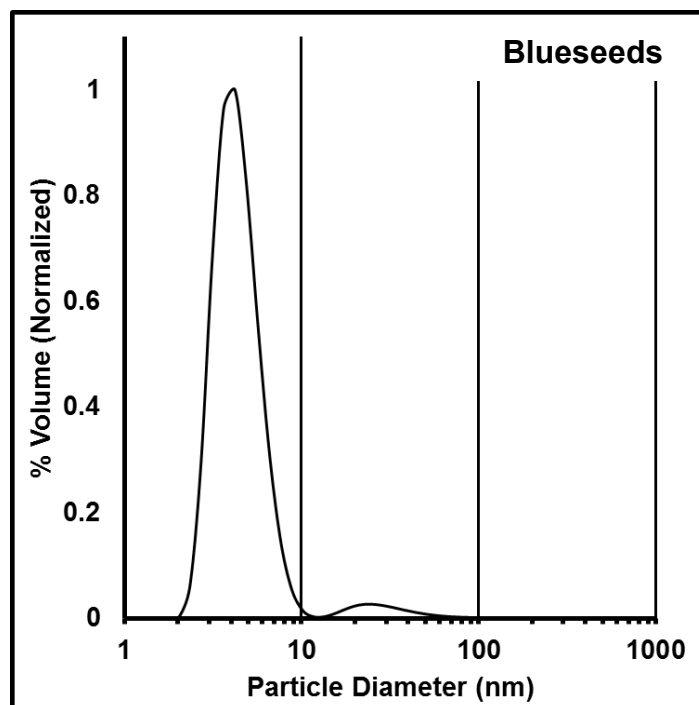
*Figure 2: High Resolution TEM (HRTEM) of primary particles of detonation nanodiamonds.*



## Blueseeds (5-10nm Seeds)

Blueseeds are the smallest available diamond seeding crystals on the market. These seeds consist of fully deagglomerated primary particles of detonation nanodiamonds. These 4-5nm, largely spherical, diamond crystals, offer the highest seeding density, and will nucleate to form a higher density of small grains, providing a higher strength and more wear-resistant film. Blueseeds are available in amounts ranging from 200mL to 3L.

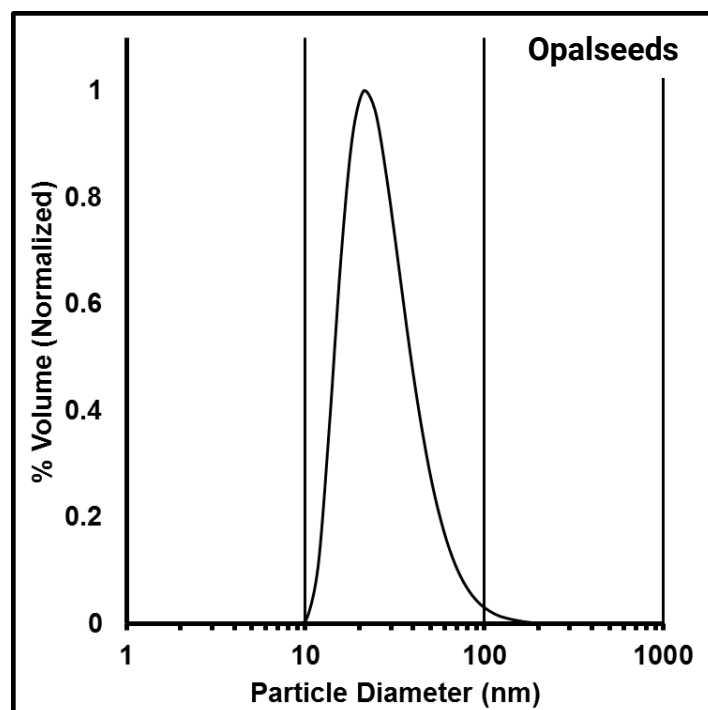
*Figure 3: Particle size distribution of Blueseeds measured using dynamic light scattering (DLS) Malvern Instruments Nano ZS.*



## Opalseeds (20-30nm Seeds)

Opalseeds, like Blueseeds, originate from detonation synthesized diamond; however, unlike Blueseeds, Opalseeds consist of 20- 30nm tight aggregates of the 4-5nm primary particles. Opalseeds offer a cheaper alternative to Blueseeds, but still provide a high quality of seeding which has been more than sufficient for a number of customers. Like Blueseeds, Opalseeds also exhibit a positive zeta potential which is best suited for negatively charged surfaces, and are sold as 5 mg/mL suspensions in dimethyl sulfoxide.

*Figure 4: Particle size distribution of Opalseeds measured using dynamic light scattering (DLS) Malvern Instruments Nano ZS.*



## Recommended Seeding Procedure:

### (1) Preparation of Seeding suspension:

- 1 part of 5 mg/mL (0.5% w/v) seeding suspension is mixed with 3 parts of methanol. The mixture should be thoroughly mixed.
- (Optional) It is recommended that a probe tip ultrasonic horn is used to homogenize the mixture, though this is not required.

### (2) Ultrasonic Seeding:

- After through cleaning of the substrate, it should be submerged into a solution of the seeding suspension such that at least 5 mm of the suspension is above the surface of the substrate. 15 minutes of ultrasonic treatment is sufficient for effective seeding.

### (3) Preparation of Substrate:

- A standard cleaning process such as the SC1 or RCA clean process can be used to remove organic contaminants from the substrate.

### (4) Post Seeding Rinse:

- After seeding, the substrate should be removed from the seeding suspension and ultrasonic bath, rinsed with methanol, and dried with inert gas or clean compressed air. The substrate is now ready for deposition growth of thin film diamond.

Category	Product	Sold As	Catalogue No.	Price
5-10nm Seeds	Blueseeds	5 mg/mL (0.5% w/v) in Dimethyl Sulfoxide (DMSO)	BlueSeeds200ml	\$395.00
			BlueSeeds400ml	\$595.00
			BlueSeeds1L	\$1,100.00
			Blueseeds3L	\$3,000.00
20-30nm Seeds	Opalseeds	5 mg/mL (0.5% w/v) in Dimethyl Sulfoxide (DMSO)	OpalSeeds200ml	\$295.00
			OpalSeeds400ml	\$495.00
			OpalSeeds1L	\$950.00
			Opalseeds3L	\$2,700.00

