Plasmability High-Purity CVD Diamond Material

Setting a New Benchmark in High-Purity CVD Diamond

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Summary

Plasmability evaluated the purity of CVD diamond plates grown in our Austin facility using **IceMaker™** reactors. Independent testing at the Gemological Institute of America (GIA) confirmed nitrogen incorporation below 1 ppb across multiple samples, with measurements as low as 0.04 ppb.

Complementary photoluminescence analysis at 77 K showed no detectable NV^0, NV^-, or SiV^- vacancy defects, even under high excitation power. These results demonstrate that Plasmability's growth process delivers exceptionally high-purity single-crystal diamond suitable for advanced optical, electronic, and quantum applications.

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EPR Measurements indicate sub-ppb nitrogen incorporation.

Using the Plasmability CVD growth system, we successfully achieved nitrogen incorporation levels under 1 ppb in single crystal diamond samples with a thickness of 0.5 mm. Nitrogen content analysis was measured utilizing a high-precision Bruker EMXmicro Electron Paramagnetic Resonance (EPR) instrument and Photoluminescence (PL) spectroscopy (Renishaw InVia Raman confocal microspectrometer).

The focus of our EPR analysis was primarily on single substitutional nitrogen (N_s^0), the dominant defect in CVD diamond. EPR is a bulk technique that can provide average N_s^0 concentrations ($[N_s^0]$) with a sensitivity down to ~ 0.05 ppb (parts per billion). This is accomplished by comparing the strength of the N_s^0 EPR signal from a specific sample to that of a reference sample with a known concentration.

Sample	$[N_s^0]$ (ppb)
P0698-704	0.1 (+0.1)
P0700-701	0.04 (±0.05)
P0708-702	0.10 (+0.03)

Figure 1. EPR measurements of CVD diamond plates grown at Plasmability

Photoluminescence Measurements show no detectable nitrogen or silicon vacancy defects.

Photoluminescence (PL) data was obtained at a temperature of 77 K using both a 514 nm laser and a 457 laser. Both measurements show no detectable signal for NV^0 (575 nm), NV- (637 nm), and SiV- (737 nm) centers. Further spectra collected at higher power (saturated Raman peak) did not reveal any defect-related emissions.

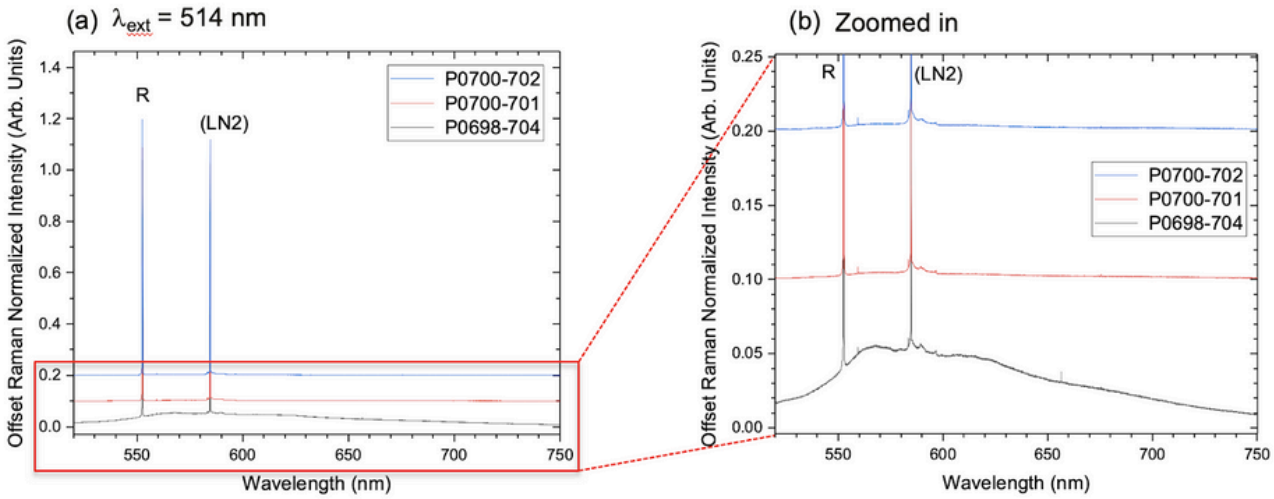

Figure 2. Photoluminescence spectra obtained at liquid nitrogen temperature (77 K) using a 514 nm green laser for excitation. The zoomed in spectra show only Raman features associated with the diamond (552 nm) and liquid nitrogen (LN2). No defect-related PL features were detected.

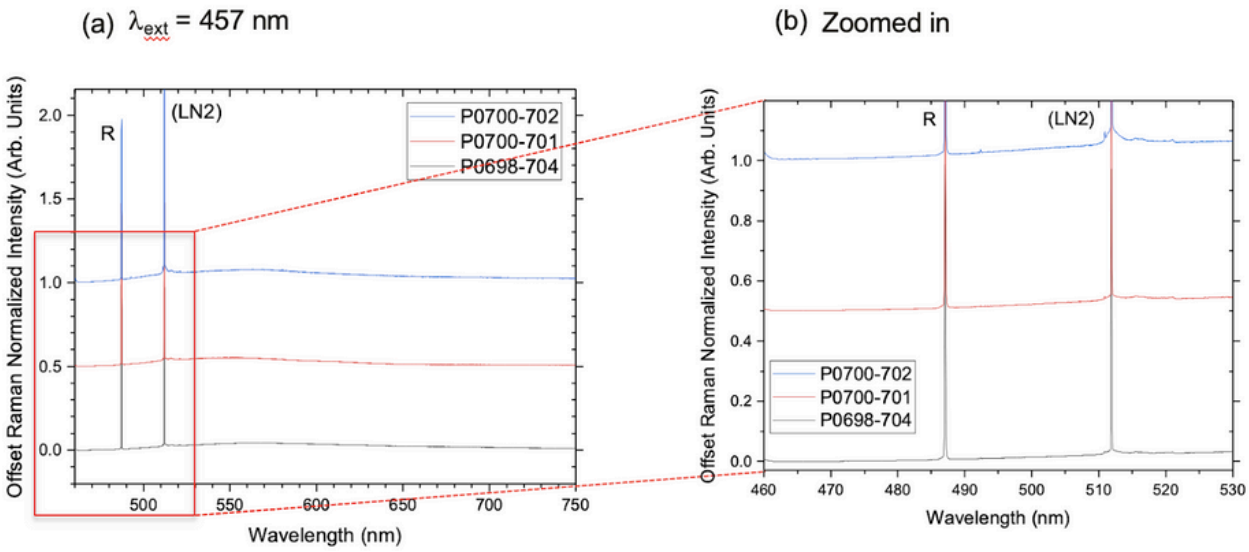

Figure 3. Photoluminescence spectra obtained at liquid nitrogen temperature (77 K) using a 457 nm blue laser for excitation. The zoomed in spectra show only Raman features from diamond (468 nm) and the liquid nitrogen (LN2). No defect-related PL peaks were detected.