



## **Nano-Diamond Ink Formulation with Strong Photoluminescence Properties**

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### **ABSTRACT**

Nano-diamond (ND) is material having unique surface, thermal and optical properties promising for application in high-power electronics, pharmacy, etc. In this report, we develop a nano-diamond ink, which can be printed in micro array applicable for anti-microbial and bio-sensor applications.

Firstly, nano-diamond was synthesized via laser ablation process. Next, the ND was dispersed in N-Methyl 2-Pyrrolidone (NMP) solvent with a mass concentration equal 5%. Then, we diluted the ND dispersion in NMP with pure NMP at 50:50 ratio in order to formulate the nano-diamond ink. The obtained dispersion was subjected sonication (Nanoruptor, Diagenode SA) at 20kHz, 250 W for 1 hour with following ultra-centrifugation (Beckman Optima Max-XP, MLS-50 rotor) at 25000 RPM for 2 hours. Finally, the resulting dispersion was filtered through a 0.7-micron glass fiber filter in order to remove remaining sediment.

Then, ND-ink characterized by optical absorption and photoluminescence (PL) excitation-emission spectroscopy. The excitation wavelength was changed with an increment of 5nm in the spectral range of 350-600 nm. The PL map shows the strongest PL with a maximum at 630 nm when ND dispersion is excited at 450 nm .

We printed ND dispersion using auto-drop ink-jet system (Micro-drop GmbH) and a perfectly separated array of nano-diamond points having a size of approximately 100um, and with a final separation distance of 100um, allowed for a homogenous layer to be obtained. The array further characterized by micro-Raman, Absorption and PL spectroscopy. The printable ND array show a great promise for fluorescence imaging and bio-sensing applications.