Nanostructured Diamond: Films and Particles

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Nanostructured diamond films and particles have a number of interesting properties and applications in the arena of nanotechnology. Nanocrystalline diamond films have potential in many areas such as MEMS/NEMS, tribology, electrochemistry, field emission, optical coatings and bio-sensing. Nanodiamond particles have a similar wide application space, as well as more specific areas such as base units for self assembly, fuctionalisation, and potentially drug delivery. Monodisperse diamond powder solutions are also a critical enabling technology for seeding non diamond wafers for diamond growth.

This work characterizes the growth and properties of nanocrystalline diamond films grown at IMO by microwave plasma enhanced chemical vapour deposition. Using UDD seeded silicon substrates, we are able to grow uniform coatings over 3" as thin as 60 nm. By growing on quartz and other transparent substrates we are able to evaluate the conductivity and transmission of these films as a function of (boron) doping concentration. Finally, highly boron doped diamond has been grown into sacrificial silicon molds to fabricate diamond AFM tips for scanning spreading resistance microscopy and biological applications.

We have also assessed the biocompatibility of diamond surfaces by performing cell assays on different diamond surfaces. We have investigated the viability of these cells cultures on different types of diamond with different terminations in order to give a quantifiable assessment of their suitability in cell culture.