Plasma treated silicon wafer: future to in-situ development of seeds for nanocrystalline diamond film growth

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Nanodiamonds are allotropes of carbon and possess unique properties such as biocompatibility, high thermal conductivity, chemical inertness, and optical transparency.We have shown the feasibility of producing nanodiamonds in gas phase utilizing a MW plasma torch when using a gas mixture of Hydrogen/Methane at 90 W injected microwave power [1]. In this work we have introduced Argon gas into the system at various flowrates and was able to consistently synthesize nanodiamonds at even 40 W of injected microwave power. The nanodiamonds were directly collected on to a silicon wafer placed downstream of the plasma torch. The synthesized nanodiamonds coexists with mixture of other carbon nanostructures. This was then grew into nanocrystalline diamond (NCD) film of 15±2 nm thickness in MWPECVD-DAA . All the materials, pre and post growth was extensively characterized using Raman spectroscopy and Scanning electron microscopy(SEM). The SEM micrographs before and after shows development of NCD film following growth in MWPECVD-DAA. Raman signal corresponding to diamond particles, Idia at 1332 cm-1 enhanced significantly following the growth in MWPECVD-DAA.

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