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## Nanodiamond grown on porous silicon substrate

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Nanocrystalline diamond (NCD) films were grown on porous silicon (PS) substrate by Chemical Vapor Deposition/Infiltration (CVD/CVI) process using a hot filament reactor. NCD formation on PS structures could be an innovative procedure for obtaining porous diamond electrode with large surface area associated with its high active sites. For PS substrate, diamond nucleation occurs preferentially on it active nucleation sites such as surface defects, apices and atom ledges promoting high nucleation rates that improve the adhesion between the film and the substrate. But, when the porosity increase over a certain extent it results in the problem of infiltration pores due to the decrease of atomic hydrogen and carbon growth species into the pore. This problem may be solved from CVI process with an additional carbon source by forming reacting species close to the substrate. In this sense, we present NCD films grown on PS substrate by the combination of CVD/CVI processes using a hot filament reactor. This procedure showed to be determinant to grow diamond grains uniformly into the pores, covering the different growth planes forming a NCD/PS porous compound. In this CVI process, pieces of reticulated vitreous carbon, produced at different temperature (RVC-2000 and RVC 1500), were used, just below the PS substrate, as an additional solid source of carbon that ensures the production of pertinent carbon growth species directly on PS sample and in its pores. PS substrates were obtained by anodization etching process of n-type silicon wafer in a hydrofluoric acid solution containing acetonitrile. Depositions of diamond films were performed using a Ar-$H_2$-$CH_4$ where the methane concentration varied from 0 up to 1.0 vol. %, to analyze the influence of RVC use as an additional carbon source on growth mechanism. Scanning Electron Microscopy (SEM) and Field Emission Gun (FEG) images of PS and NCD film morphology showed a strong influence of RVC presence in NCD nucleation. XRD diffractograms presented the characteristic diamond diffraction peaks while micro-Raman spectra also confirmed the features of NCD coating.

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