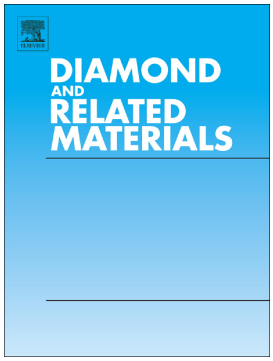

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Facile Synthesis of Novel Octopus-like Carbon Nanostructures by Chemical Vapor Deposition

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Abstract

Growth of novel carbon nanomaterials has been of great interest for researchers due to their potential applications in nano-devices. In the current work, we reported radial growth of novel octopus-like carbon nanostructures (OCNS) by chemical vapor deposition (CVD), using methane as carbon precursor gas, and Cu film sputtered on Si/SiO_2 substrate as the catalyst. Annealing at high temperature transforms Cu thin film to catalytic copper nanoparticles (CuNPs), which on exposure to methane results in the radial growth of carbon nanofibers (CNFs) departing from the central CuNPs. The size of OCNS and morphology vary as a function of Cu film thickness, precursor gas concentration, and growth time. High methane concentration boosts up growth kinetics, resulting in long carbon fibers in addition to OCNS, with fiber length varying from a few hundred nanometers to several hundred microns. Effect of substrate on the morphology of carbon nanostructures is also studied using Cu film sputtered on silicon, quartz, and Si/SiO_2 substrates. The branch like morphology of OCNS exhibits large surface/contact area for their applications in electronic and electrochemical devices.

Keywords: Chemical Vapor Deposition; Carbon Nanofibers; Carbon Nanostructures; Carbon Materials; Thin Film; Nano Devices.

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