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Characterization of Single-Walled Carbon Nano Tubes Forest Decorated with Chromium

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Abstract : Carbon nanotubes are one of the main elements in nanotechnologies; their applications are in microelectronics, nano-electronics devices (photonics, spintronic), chemical sensors, structural material and currently in clean energy devices (supercapacitors and fuel cells). The use of magnetic particle decorated carbon nanotubes increases the applications in magnetic devices, magnetic memory, and magnetic oriented drug delivery. In this work, single-walled carbon nanotubes (CNTs) forest decorated with chromium were deposited at room temperature by high-density plasma chemical vapor deposition (HDPCVD) system. The CNTs forest was obtained using pure methane plasmas and chromium, as precursor material (seed) and for decorating the CNTs. Magnetron sputtering deposited the chromium on silicon wafers before the CNTs' growth. Scanning electron microscopy, atomic force microscopy, micro-Raman spectroscopy, and X-ray diffraction characterized the single-walled CNTs forest decorated with chromium. In general, the CNTs' spectra show a unique emission band, but due to the presence of the chromium, the spectra obtained in this work showed many bands that are related to the CNTs with different diameters. The CNTs obtained by the HDPCVD system are highly aligned and showed metallic features, and they can be used as photonic material, due to the unique structural and electrical properties. The results of this work proved the possibility of obtaining the controlled deposition of aligned single-walled CNTs forest films decorated with chromium by high-density plasma chemical vapor deposition system.

Keywords : CNTs forest, high density plasma deposition, high-aligned CNTs, nanomaterials
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