

研究論文

SPS 処理を施したナノカーボン材料の特性

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Characteristics of spark plasma sintered nanocarbon materials

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We prepared binder-free monoliths of carbon nanohorns (CNHs), hole-opened carbon nanohorns (CNHoxs), multi-walled carbon nanotube (MWCNT), and single-walled carbon nanotube (SWCNT) using spark plasma sintering (SPS) method at 1800°C and 80MPa in vacuum. The density of the SPS-treated SWCNT is 1.8g/cm³, which is close to that of graphite, while those of CNHs, CNHoxs, and MWCNT remained 1.1-1.3g/cm³ even after SPS treatment. We evaluated the monoliths using Raman spectroscopy and scanning electron microscopy observation, which showed a significant defect formation and graphitization of SWCNTs. Moreover, the increase of defects density in CNHs, CNHoxs, and MWCNT was moderate, and sub-micron size structures remained. We observed that the monoliths of CNHs and CNHoxs were highly conductive with a Hall mobility of positive holes of ~50cm²/Vs and electrical conductivity of ~300S/cm. These experimental results indicated that the SPS treatment under appropriate conditions could provide a CNHs monolith with nanostructure and good electrical conductivity.

Keywords : carbon nanohorns, Spark Plasma Sintering, Raman spectroscopy, nanostructure, mobility, electrical conductivity