

Bulk production of high-purity carbon nanosphere by combination of chemical vapor deposition methods

ABSTRACT

A simple method to produce pure carbon nanosphere (CNS) in high yield using continuous chemical vapor deposition (CVD) technique (combination of floating catalyst CVD and fluidized bed CVD) is proposed. Carbon fiber substrate, acetylene precursor, and Fe catalyst are employed to produce CNS. X-ray diffraction (XRD) and energy dispersive X-ray (EDX) spectrometry confirm the formation of a high percentage of hexagonal carbon. The scanning electron microscopy images reveal spheres that confirm uniform structures. Thermal gravimetric analysis implies that the CNS are free from the carbon fiber substrate as they start to decompose at a lower temperature compared to that of carbon fiber substrate. Under the optimal conditions of 700°C in ambient pressure at 60 min of reaction time and 300 mL/min of acetylene flow rate, CNS with an average diameter of less than 200 nm, 98% purity and yield of 3.07 mg/mg is obtained.

Keyword: Carbon nanosphere; Chemical vapour deposition; Fluidized bed CVD; Floating catalyst CVD; Uniform structure