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Fabrication of Size-tunable Graphitized Carbon Spheres with hierarchical surface morphology on *p*-Si (100) by Chemical Vapor Deposition

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ABSTRACT

Graphitized carbon spheres (GCSs) with varying dimensions (diameter 500 nm to 4.5μm) and hierarchical surface morphologies were fabricated on Fe-coated silicon (100) substrate at 750°C by chemical vapor deposition (CVD). By varying the mass flow rate of precursor gasses (C_2H_2, C source, and N_2 carrier) and the process of catalyst coatings, GCSs with differing morphologies and dimensions were obtained. When the precursor gases flow rate was varied, the mean diameter of GCSs increases to an optimum value (~3μm). The varying GCSs dimensions suggest favorable conditions for size tunability. When compared to dip-coating, the spin-coating on silicon (100) results in larger GCSs. Field emission-scanning electron microscopy (FE-SEM) images show regular and uniform shaped GCSs with hierarchical surface morphology. The variation of the GCSs size as a function of surface roughness was estimated computationally. Larger-sized GCSs generated by catalyst spin-coating show enhanced mass transfer rates of precursor gases due to increased surface roughness. Raman spectroscopy and X-ray diffraction measurements of GCSs confirmed the presence of graphitized hexagonal carbon networks. The surface functional groups of the GCSs results were examined using FTIR spectroscopy.

Keywords: Graphitized Carbon Spheres, Chemical vapor deposition, Hierarchical surface morphology, Size tunability

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