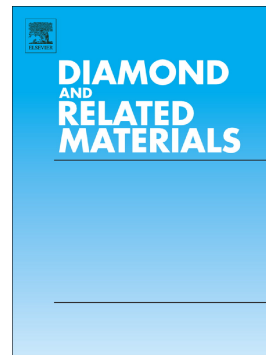


Accepted Manuscript

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PII: S0925-9635(16)30668-9
DOI: doi: [10.1016/j.diamond.2017.02.005](https://doi.org/10.1016/j.diamond.2017.02.005)
Reference: DIAMAT 6814
To appear in: *Diamond & Related Materials*
Received date: 15 December 2016
Revised date: 29 January 2017
Accepted date: 6 February 2017

Please cite this article as: Z.N. Tetana, S.D. Mhlanga, N.J. Coville , Chemical vapour deposition syntheses and characterization of boron-doped hollow carbon spheres. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Diamat*(2016), doi: [10.1016/j.diamond.2017.02.005](https://doi.org/10.1016/j.diamond.2017.02.005)

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Chemical vapour deposition syntheses and characterization of boron-doped hollow carbon spheres

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Keywords

Hollow carbon spheres; CVD synthesis; boron doping; trimethyl borate

Abstract

We report a novel and simple method for the growth of boron-doped hollow carbon spheres (B-HCSs) synthesized *via* chemical vapour deposition (CVD) at 900 °C using acetylene as the carbon precursor and trimethyl borate as a carbon and boron source. The B-HCSs as well as BO_x filled CSs were synthesized using a vertical (or horizontal) furnace and the properties of the produced materials were compared to undoped carbon spheres (CSs) synthesized in a vertical furnace. The morphology and size, as well as the shell thickness of the B-HCSs was not substantially affected by varying the ratio of Ar to H₂ carrier gas ratio and the type of furnace used (horizontal vs. vertical furnace); the yield was affected by the Ar/H₂ ratio. TGA analysis confirmed the presence of B₂O₃ (25-35%) in the core of the unpurified product and this B₂O₃ could be removed by boiling water. HAADF-STEM analysis confirmed the presence of B₂O₃ in the centre of the carbon spheres. B-HCSs synthesized with 100% Ar and also 100% H₂ were analysed by XPS. The level of boron content in these samples was found by XPS to be 0.19 wt% B when made under H₂ while the product made under Ar contained

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