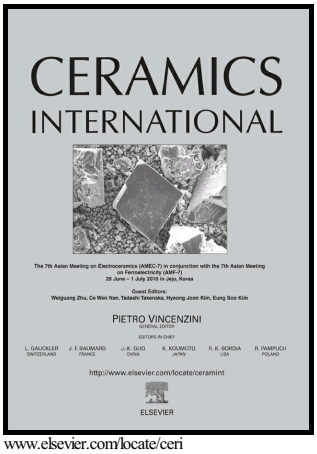

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Synthesis of boron nitride nanotubes by combining citrate-nitrate combustion reaction and catalytic chemical vapor deposition

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Abstract:

High-quality boron nitride nanotubes were successfully synthesized *via* a novel two-step method, including citrate-nitrate combustion reaction and catalytic chemical vapor deposition. The composition, bonding features and microstructures of as-synthesized sample were investigated by X-ray diffraction, Fourier transform infrared spectroscopy, Raman microscopy, X-ray photoelectron spectroscopy, scanning electron microscopy coupled with energy dispersive X-ray spectroscopy, transmission electron microscopy and selected area electron diffraction techniques. The results show that the as-synthesized boron nitride nanotubes with smooth surface are relatively pure. The diameter ranges between 20-80 nm, while the length is about dozens of micrometers. During the synthesis process of boron nitride nanotubes, citric acid chelates the cobalt ions and reacts with nitrate to form the cobalt oxide, depositing on the surface of boron powder homogeneously. The catalyst content and annealing temperature have a significant impact on the composition and microstructures of the final products. Based on the experimental results and thermodynamic analysis, the possible chemical reactions are listed, and vapor-liquid-solid mechanism is proposed to be dominant for the formation of boron nitride nanotubes.