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Analysis of BNNT(Boron Nitride Nano Tube) synthesis by using Ar/N2/H2 60KW RF ICP plasma in the difference of working pressure and H2 flow rate

I Hyun Cho[1], Hee Il Yoo[1], Ho Seok Kim[1], Se Youn Moon[1,2]*, Hyun Jin Cho[3], Myung Jong Kim[3]

[1]High Enthalpy Plasma Research Center, Chonbuk National University, Republic of Korea,
[2]Department of Quantum System Engineering, Chonbuk National University, Republic of Korea,
[3]Soft Innovative Material Research Center, Korea Institute of Science and Technology, Republic of Korea

A radio-frequency (RF) Inductively Coupled Plasma (ICP) torch system was used for boron-nitride nano-tube (BNNT) synthesis. Because of electrodeless plasma generation, no electrode pollution and effective heating transfer during nano-material synthesis can be realized. For stable plasma generation, argon and nitrogen gases were injected with 60 kW grid power in the difference pressure from 200 Torr to 630 Torr. Varying hydrogen gas flow rate from 0 to 20 slpm, the electrical and optical plasma properties were investigated. Through the spectroscopic analysis of atomic argon line, hydrogen line and nitrogen molecular band, we investigated the plasma electron excitation temperature, gas temperature and electron density. Based on the plasma characterization, we performed the synthesis of BNNT by inserting 0.5~1 um hexagonal-boron nitride (h-BN) powder into the plasma. We analysis the structure characterization of BNNT by SEM (Scanning Electron Microscopy) and TEM (Transmission Electron Microscopy), also grasp the ingredient of BNNT by EELS (Electron Energy Loss Spectroscopy) and Raman spectroscopy. We treated bundles of BNNT with the atmospheric pressure plasma, so that we grow the surface morphology in the water attachment of BNNT. We reduce the advancing contact angle to purity bundles of BNNT.

Keywords: BNNT(boron nitride nano-tube), Plasma, SEM(Scanning Electron Microscopy), TEM(Transmission Electron Microscopy), EELS(Electron Energy Loss Spectroscopy), Raman spectroscopy, Contact angle