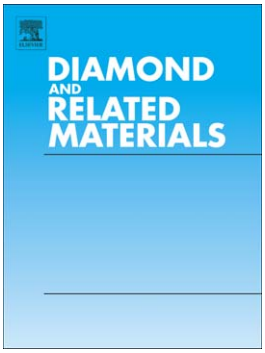

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Preparation of Carbon Black via Arc Discharge Plasma Enhanced by Thermal Pyrolysis

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Abstract

Carbon black (CB) was prepared via arc discharge non-thermal plasma which was enhanced by thermal pyrolysis process, in which propane was cracked into CB with controlled structure and hydrogen. Argon was also introduced along with the propane. Detailed parameters like discharge current, argon flow rate, propane flow rate and cracking temperature were discussed in order to obtain optimal conditions for generating CB with high productivity, yield and well developed structure. The morphology of CB was charactered by scanning and transmission electron microscopy. X-ray diffraction, X-ray photoelectron spectroscopy, Raman spectroscopy and BET surface area analysis were used to analysis the structure of CB. The results showed that the yield of CB could be 85.9% under optimal operating conditions, the spherical CB produced by this process possessed a narrow size distribution. Thermal pyrolysis began to significantly serve above 500℃, and the yield under 700℃ was higher than that of plasma process without electrical heating assistance. Resistivity of the CB was decreased with increasing discharge current and pyrolysis temperature. Mechanism of CB formation in our process was assumed according to experimental phenomenon and the widely accepted formation mechanism of furnace type CB.

Keywords: Carbon black; Plasma; Pyrolysis.

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