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RF-Plasma Controlled High-Yield Synthesis and Properties of Nitrogen Endohedral Fullerene SOON CHEON CHO, TOSHIRO KANEKO, RIKIZO HATAKEYAMA, Department of Electronic Engineering, Tohoku University — The nitrogen atom endohedral fullerene ($N@C_{60}$) has been synthesized by sublimating a fullerene (C_{60}) and irradiating nitrogen ions to the fullerene using a radio-frequency (RF) plasma at low pressures for the purpose of achieving its high yield and purity. Here external control of direct-current (DC) bias voltages applied to functional electrodes in the RF plasma is found to enables us to instantaneously and highly generate nitrogen molecule ions (N_2^+) which are indispensable among the nitrogen plasma parameters for synthesizing the high purity/yield $N@C_{60}$. Then, it is clarified that an optimum condition for the high-density generation of N_2^+ is obtained by controlling the negative and positive bias voltages of a plasma-separation grid and a plasma-terminating plate, respectively. In more detail the potential difference caused by the bias voltages produces an electron beam which effectively ionizes the nitrogen molecules. The generated N_2^+ ions arriving in front of a substrate immersed in the plasma are accelerated by the potential difference between the negatively biased substrate and the plasma, and are irradiated to a large amount of C_{60} sublimated from an oven and deposited on the substrate resulting in the high-purity and high-yield synthesis of $N@C_{60}$.

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