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Internal DLC Coating of Narrow Metal Tubes with High-Density Near Plasma Sustained by Microwave Propagation along Plasma-Sheath Interfaces HIROYUKI KOUSAKA, Nagoya University — Recently, internal DLC coating of metal tubes is strongly desired. Plasma processing of such a 3-dimensional metal substrate is typically conducted by using RF and DC plasmas where negative voltage is applied to a metal substrate against a grounded chamber at low gas pressures. However, the typical plasma electron density, n_e of RF and DC plasmas is no more than 10^9–10^{10} cm^{-3}, by which internal processing of metal tubes less than 1 cm in width cannot be performed under typical conditions. For internal plasma processing of such narrow metal tubes, generation of higher-density (n_e >10^{11} cm^{-3}) plasma inside a tube is essential. In our previous works, it was demonstrated that plasma column is steadily sustained inside a narrow metal tube, whose inner diameter is in the range of millimeters and the length is more than 10 times of it, by using high-density near plasma sustained by microwave propagation along plasma-sheath interfaces. In this work, the inner surface of a stainless-steel tube (SUS304, JIS) 4.4 mm in inner diameter and 50 mm in length was coated with DLC by using the plasma column. This work was partly supported by a Grant-in-Aid for Young Scientists (B), No. 19740343 (2007-2008), from the Japan Society for the Promotion for Science, and Tokai Region Nanotechnology Manufacturing Cluster, Knowledge Cluster Initiative (The Second Stage, 2008-).

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