Abstract Submitted
for the GEC05 Meeting of
The American Physical Society

Deposition of Aligned Carbon Nanofibers in Highly Collisional Sheath TOMOHIRO NOZAKI, KUMA OHNISHI, KEN OKAZAKI, Tokyo Institute of Technology, JOACHIM HEBERLEIN, UWE KORTSHAGEN, University of Minnesota, TOKYO INSTITUTE OF TECHNOLOGY TEAM, UNIVERSITY OF MINNESOTA TEAM — Deposition of vertically oriented carbon nanofibers (CNFs) has been studied in atmospheric pressure radio frequency discharge (APRFD) where dielectric barrier is not inserted between metallic electrodes. If frequency is sufficiently high so that ions are trapped in the gap, the operating voltage is remarkably decreased. Then transition of glow discharge into arc discharge is suppressed without dielectric barrier. More importantly, trapped ions produce cathodic sheath in the boundary of bulk plasma and electrode where large potential drop exists. The primary interest of present work is to study how such highly collisional cathodic sheath works on the alignment of CNFs. The absence of dielectric barrier enables us to superpose external DC potential to the substrate, which might provide sufficient field strength in the boundary for the orientation of CNFs, while the damage of CNFs due to ion bombardment should be negligible in atmospheric pressure. Emission distribution of He (706 nm), Hα (656 nm), and CH (432 nm) clearly showed that negative DC bias enhances the formation of cathodic sheath near the substrate. Both deposition rate and alignment of CNFs are remarkably improved by the application of negative DC bias.

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Date submitted: 13 Jun 2005 Electronic form version 1.4