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Control Capabilities of Low-Inductance-Antenna-Driven RF Plasmas for Low-Damage Processing of Polymers[1] YUICHI SETSUHARA, Osaka Univ., JST, CREST, KOSUKE TAKENAKA, KEN CHO, Osaka Univ., AKINORI EBE, EMD Corp., MASAHARU SHIRATANI, Kyushu Univ., JST, CREST, MAKOTO SEKINE, MASARU HORI, Nagoya Univ., JST, CREST — Low-damage processing of polymers is of key importance for fabrication of next-generation devices including electronics on polymers, which require development of plasma sources with reduced plasma potential in order to control interface between the polymer substrate and functional films without suffering degradations due to ion bombardment. Furthermore, applications to polymer-based displays and photovoltaic devices require ultra-large area processes at high throughput. To meet these requirements, we have developed plasma processing technologies with low-inductance antenna (LIA) modules to sustain inductively-coupled RF plasmas. Ion energy distributions showed considerably suppressed ion energy as low as 3.8 eV. The polymer surfaces after plasma exposure were analyzed via hard x-ray photoelectron spectroscopy (HX-PES) at SPring8 (National SOR facility in Japan), which exhibited nano-surface modification of polymer surface without suffering degradation of molecular structures underneath. Furthermore, plasma-enhanced deposition of silicon films showed low-temperature (200 deg.C) formation of micro-crystalline silicon films due to sufficiently reduced damage during deposition.

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