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Diagnostics of plasma-surface interactions in plasma processes

KENJI ISHIKAWA, Nagoya University

Low temperature plasma including electrons, ions, radicals and photons can be applied because only high temperature of electron but for background gases. Recently plasma applications in biology and medicine have grown significantly. For complexity of mechanisms, it is needed to understand comprehensively the plasma-surface interactions. To diagnose the interactions comprises of three areas; (1) incident species generated in plasmas toward the surface, (2) surface reactions such as scission and bond of chemical bonds, and (3) products after the reactions. Considered with non-linearity of the chemical reactions as changed by an initial state, we have focused and developed to observe dangling bonds in situ at real time by electron spin resonance (ESR). Moreover, individual contribution and simultaneous irradiation of each species such as radicals and photons have been studied in utilization of light shades and windows in similar manner of the pellets for plasma process evaluation (PAPE) [1]. As exampled, the interaction of polymeric materials [2], fungal spores[3] and edible meats with plasmas were studied on the basis of the real time in situ observations of dangling bonds or surface radicals formation.

[1] S. Uchida et al., J. Appl. Phys. 103, 073303 (2008);
[2] K. Ishikawa et al., J. Phys. Chem. Lett. 2, 1278 (2011).
[3] K. Ishikawa et al., Appl. Phys. Lett. 101, 013704 (2012).