CAMT Seminar

"Graphene multiscale temporal evolution investigated with an Innovative setup for fundamental studies of plasma-surface interactions"

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Location: Main Conference Room (1st floor), Bldg. A12
Center for Atomic and Molecular Technologies (CAMT)
(A12 棟 1 階会議室)
& Webex Link (hybrid)

Abstract

During deposition, modification, and etching of thin films and nanomaterials in reactive plasmas, a large number of active species can interact with the sample simultaneously. This includes reactive neutrals created by fragmentation of the feed gas, positive ions and electrons created by electron-impact ionization of the feed gas and fragments, excited states (in particular the long-lived metastable species), and UV photons due to the spontaneous de-excitation of excited atoms and molecules. In order to provide insights into the dominant role of each active species in specific plasma-based processes of advanced materials, a unique system has been established combining beams of neutral atoms, positive ions, UV photons and a magnetron plasma. Furthermore, this setup is equipped with a unique ensemble of in plasma surface characterization tools. The reactor chamber is attached to an ion beam line of a 1.7 MV Tandetron accelerator generating a beam at grazing incidence that allows Rutherford Backscattering Spectrometry (RBS) to be carried out at high resolution near the surface. Elastic recoil detection (ERD) can also be used for standard ERD detection of H, but high resolution of surface H is available through nuclear reaction analysis. It In parallel, an optical port facing the substrate allows to perform Raman spectroscopy of the samples during plasma modification of the substrate. This system enables fast monitoring of a given Raman peak over nine points scattered on a surface of 2 mm2 without inter-ference from the light emitted by the plasma. An example of a possible experiment involving monolayer graphene will be presented. Raman measurements in real-time shed light on the influence of low-energy ions on monolayer CVD graphene and how self-healing takes place immediately after irradiation. The mechanism responsible will be also be detailed to show that carbons adatoms resulting from vacancy creation are essential for graphene self-healing.

(Host: Satoshi Hamaguchi Ext：7913)