[총회초청]

Desorption induced by electronic transitions of water clusters at the surface of rare gas solids

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The investigation of electronic excitation processes which are followed by chemical reaction on an ice particle is one of the most important subjects in the field of environmental and planetary sciences. We have studied water clusters which are desorbed from the surface of rare gas solids by electronic or photo excitation[1].

A laser plasma vacuum ultraviolet light source (LPLS) has been developed as an excitation source for the photo-stimulated desorption (PSD) study[2]. A Q-switched Nd-YAG laser beam is focused on a rotatable cylindrical Ta target to produce metal plasma. The light emitted from the plasma is monochromatized with three toroidal gratings, which cover the wavelength range from 4 to 108 nm, and is introduced into a PSD experimental chamber. Our LPLS apparatus provides pulse photon beam with the intensity of 10^7-10^8 photon/pulse, the pulse width less than 15 nsec, and the wavelength resolution $\lambda/\Delta\lambda$ of 50-100.

A small amount of water (< 1 monolayer) was physisorbed on the surface of solid rare gas, Ne, Ar, Kr, or Xe, prepared on a cold metal substrate. In the mass spectrum of photo-desorbed ions, which was measured by a time-of-flight technique, a series of protonated water cluster ions, $(H_2O)_nH^+$ {n = 1-15}, was observed together with a relatively weak signal of unprotonated water ions, H_2O^+ and $(H_2O)_2^+$. In order to determine the desorption thresholds, the desorption yields were measured as a function of the incident photon energy. The results indicated that the core excitation of a rare gas atom leads the desorption of the water clusters[1, 3]. Though the distribution of n depends on the amount of water deposited and the substrate temperature, it is apparently of the Poisson one with a average size as an only parameter.

In this talk, the unique characteristics of our LPLS experimental system will be introduced and our recent experimental results will be discussed.

[References]
1. T. Tachibana et al., Shinku [J. Vac. Soc. Jpn.] **46**, 257 (2003).
2. J. Sato et al., Shinku [J. Vac. Soc. Jpn.] **46**, 559 (2003).
3. T. Tachibana et al., Surf. Sci. submitted.