Electron Spin Resonance Study of UV-Induced CHO Radicals in Amorphous Ice Adsorbing CO Molecules

Kimihiro Norizawa[1], Takeshi Yada[2], Motoji Ikeya[2]

[1] Earth and Space Sci., Osaka Univ., [2] Earth and Space Sci., Osaka Univ

http://pumice.ess.sci.osaka-u.ac.jp/~kimi/

We will report the behavior of UV-induced radicals in CO-adsorbed amorphous ice using electron spin resonance (ESR) in order to simulate chemical evolutions in icy dusts.

Chemical evolution of organic compounds in solar system bodies of ice such as icy satellites, comets and icy interstellar dusts would be mainly due to photolyzed reactions in ices or on the surfaces of ice. Water molecules of H2O are deposited in the environments of extremely low temperature and high vacuum in space and the ices are not crystalline but amorphous. Adsorbed molecules are important to know chemical evolutions in space, since amorphous ice can adsorb many kinds of molecules because of its porous structure.

It is well known that ultraviolet light photolyzes ices doped with CH4, CO, CO2 and NH3. Then organic compounds are formed and these reactions have been studied by IR absorption. ESR method can directly detect free radicals, which are very important in chemical reactions.

Many studies on complicated icy samples doped with several kinds of molecules have been reported, but it is necessary to study simple samples such as H2O-CO, H2O-CH4 and H2O-NH3 in order to understand chemical reactions. Thus CO-adsorbed amorphous ice was adopted as the simple icy samples in this experiment.

Amorphous ice was deposited on the copper finger kept at 77 K in a vacuum from water vapor and then gaseous CO was adsorbed on the icy surface and irradiated by low-pressure mercury lamp. The ESR spectra of CO-adsorbed amorphous ice showed the radical formation of HO2 and CHO. We will discuss the production efficiency and the thermal stability (reaction rate constant) of CHO.