Thermal stability of free radicals in amorphous ice using ESR analysis

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Water molecules of H2O are deposited on solar system bodies of ice and do not become crystalline but amorphous not ice. Photolysis of adsorbed molecules is important to know chemical evolutions in space, since amorphous ice can adsorb many kinds of molecules because of its porous structure.. Electron spin resonance (ESR) method can directly detect free radicals in chemical reactions. Amorphous ice samples were deposited on the copper finger at 77 K in a vacuum from water vapor and irradiated by low-pressure mercury lamp. The ESR spectra of samples doped with 1% H2O2 showed the radical formation of HO2. The thermal characteristics of free radicals in UV-irradiated amorphous ice will be reported taking to the vapor deposited amorphous ices in icy bodies in space.

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. Electron spin resonance (ESR) method can directly detect free radicals, which are very important in chemical reactions. Bednarek reports a first ESR study of gamma-irradiated amorphous ice in 1996 and OH and HO2 are detected, but anyone has not reported recent study. Therefore we reported the ESR spectra of UV-irradiated amorphous ice to apply to the study of icy bodies in space at Japan earth and planetary science joint meeting in 2000.

Amorphous ice samples were deposited on the copper finger kept at 77 K in a vacuum from water vapor and irradiated by low pressure mercury lamp. The ESR spectra of samples doped with 1% H2O2 showed the radical formation of HO2 and thermal dependence (77K-200K) of ESR spectra was obtained. The thermal characteristics of free radicals in UV-irradiated amorphous ice will be reported taking to the vapor deposited amorphous ices in icy bodies in space.