

Proton Transfer at the Surface of Ice

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We studied proton transfer at the surface of ice films by measuring the surface concentration of protons and the H/D isotopic exchange between H₂O and D₂O molecules using the technique of Cs⁺ reactive ion scattering (Cs⁺ RIS). Ice films were deposited on a Ru(0001) substrate from H₂O and D₂O gases. The H/D exchange was extremely slow on pure ice films at 95-100 K, and it occurred in a time scale of several minutes at 140 K. Adding excess protons to ice films by HCl greatly accelerated the isotopic exchange reaction, such that it went to completion very quickly at 90-140 K. The rapid reaction, however, was confined within the first bilayer of the surface and did not readily propagate to the underlying sublayer. The result indicates that proton transfer is highly directional, fast in the lateral direction at the surface but slow in the vertical direction.

[참고문헌]

1. H. Kang, "Chemistry of Ice Surfaces. Study of Elementary Reactions on Ice by Reactive Ion Scattering", Acc. Chem. Res. 38, 893 (2005).