AOGS 2005


# Formation route for deuterated formaldehyde on a grain surface

HIROSHI HIDAKA[1], AKIHIRO NAGAOKA[1], NAOKI WATANABE[1], and AKIRA KOUCHI[1]

[1]*Institute of Low Temperature Science, Hokkaido University*

Formaldehyde ($H_2CO$) was observed abundantly in ice dusts toward various molecular clouds. Theoretical models and our experimental works have revealed that $H_2CO$ molecules can be efficiently produced by hydrogenation of CO on an interstellar ice surface. Recently, singly and doubly-deuterated formaldehyde was found in molecular clouds and comets with the D/H ratio of up to 0.15, indicating the highly deuterium fractionation because of the cosmic D/H ratio of $10^{-5}$. We believe that the surface reactions on ice dusts must play an important role in the D fractionation of formaldehyde as well as in the formation of $H_2CO$. We investigated the formation process of deuterated formaldehyde experimentally. Below 20 K, solid $H_2CO$ and $D_2CO$ were exposed to cold D and H atoms, respectively. Reactions of H-D substitution in formaldehyde molecules were found to proceed like in methanol. The rates of H-D substitution in those molecules were measured. Comparing the obtained rates with those for deuteration of CO, we discuss the possible formation route for the deuterated formaldehyde on an ice surface.

Keywords: deuterated formaldehyde, surface reaction, deuterium fractionation.