

Catalytic effect of amorphous solid water on surface reactions of hydrogen atoms at very low temperatures

N. Watanabe¹, H. Hidaka¹, A. Nagaoka¹, and A. Kouchi¹

¹*Institute of Low Temperature Science, Hokkaido University, JAPAN*

The role of amorphous solid water (ASW) in surface reactions of hydrogen atoms with molecules was investigated. In the series of our experiments on hydrogenation (deuteration) of CO and O₂ molecules [1-3], and H-D substitution in methanol [4], the comparison of reactivities was made between on the surfaces of pure solid reactant molecules (i.e., pure solid CO, O₂, and methanol) and ASW. It was found that the effective reaction rates are enhanced on the surface of ASW at relatively higher temperatures. This catalytic effect of ASW would be due to the higher adsorption energy of hydrogen atom for ASW than the surface of pure reactant solids and/or the modification of potential energy surfaces by water molecules.

References

- [1] N. Watanabe, A. Nagaoka, T. Shiraki, & A. Kouchi, 2004, ApJ, 616, 638.
- [2] N. Watanabe, A. Nagaoka, H. Hidaka, T. Shiraki, T. Chigai, & A. Kouchi, *Planet. Space Sci.* 2006, 54, 1107.
- [3] Y. Oba et al. 2008, in preparation
- [4] N. Watanabe & A. Kouchi, 2008, submitted to Prog. Surf. Sci.