

Process of Methanol Desorption due to Hydrogen Atom Exposure of Solid Methanol at Low Temperature

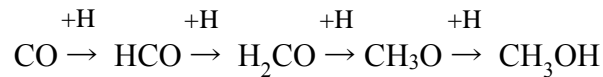
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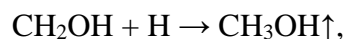
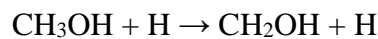
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Molecular clouds (MCs) are cold (~10K) and dark (small UV flux) objects and are the place for the ‘early phase of chemical evolution’ in space [1]. In such an environment, non-thermal chemical reactions involving atom tunneling on interstellar grains is one of the most important processes for chemical evolution [7]. Methanol (CH₃OH), a precursor of complex organic molecule, is one of the abundant molecules which has been found in both gas and solid phases of MCs. Methanol can be formed by the successive hydrogen atom addition to carbon monoxide via H₂CO formation on a grain surface, called CO hydrogenation [2, 4].



Reaction network calculation cannot reproduce the amount of gaseous CH₃OH observed by only the chemistry of gas-phase reactions [5]. Thus, to explain the abundance of gaseous methanol, the desorption of solid CH₃OH has been theoretically suggested as one of the candidates for supplying gaseous CH₃OH [5, 6]. Chemical desorption which is triggered by releasing the heat of reaction during CH₃OH formation on a grain surface would be a major desorption process because other desorption, thermal and photo desorption, cannot work efficiently in the MC’s environment. Recently, Chuang *et al.* (2018) had conducted experiments for studying chemical desorption occurred during the sequential reactions of CO hydrogenation and reported the desorbed amount as the amount of total carbon loss [3]. We focus on the chemical desorption of only methanol by the following reactions,



and conducted the experiments of H atoms exposure of solid methanol on amorphous solid water (ASW) at 10K. In this presentation, we show an evidence of the methanol desorption by the chemical desorption process and discuss problems that we must consider when applying experimental results to the reaction network calculation in MCs.

References

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