The Addition of deuterium atom to carbon mono-oxide on interstellar ice surface

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Recent observations showed a large abundance of deuterated formaldehyde and methanol in interstellar ice. We expect that most of deuterated formaldehyde (D2CO) and methanol-d1-4 is produced on interstellar ice surface by the addition reaction of D to CO and/or by H-D substitution reaction from H2CO to D2CO. Therefore, we performed experiments of addition of deuterium atom to CO on CO + H2O ice surface at 10 and 15 K by using Fourier transform infrared spectrometer (FTIR), in order to find the cause of the large deuteride abundance in interstellar ice. From the IR absorption spectra, the conversion of CO to D2CO and CD3OD by successive addition of deuteron atom was measured at 10 and 15 K. These reaction processes would be CO-DCO-D2CO-CD3O-CD3OD. The ice temperature dependence of the CO decreasing do not appeared, and this result is same as hydrogenation of CO experiment (Watanabe et al. 2003). The reaction rate constant ratio kD/kH of CO-DCO and CO-HCO is about 0.25. This ratio indicates that the reaction of CO-DCO is five times slower than CO-HCO. Therefore, the addition of D to CO reaction cannot explain large abundance of D2CO/H2CO in interstellar ice surface.