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Infrared spectra and thermodynamic properties of CO2/methanol ices

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Ices of mixtures of carbon dioxide and methanol have been studied in a range of temperatures relevant for comet nuclei, planets and satellites of the solar system and protostellar environments. We have performed temperature programmed desorption measurements and recorded infrared spectra of various types of samples. The presence of two slightly different CO_2structures, which can be referred to as “normal” and “distorted”, is put into manifest (1). If the samples are heated above 130 K, the distorted CO_2 sublimates and only the normal structure remains. The latter can stay trapped until the sublimation of crystalline methanol (150 K).

The desorption energy of CO_2 from methanol ice, and the specific adsorption surface area of amorphous CH_3OH ice have been determined. CO_2 does not penetrate into crystalline ice. CO_2/CH_3OH ices formed by simultaneous deposition admit two orders of magnitude more CO_2 than sequentially deposited ices. These and other findings will be discussed in the presentation.

(1) Belén Maté, Óscar Gálvez, Víctor J. Herrero and Rafael Escribano, Astrophysical Journal, 690 (2009) 486-495.