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Infrared spectra and thermodynamic properties of CH4/H2O ices

O. Galvez, B. Mate, V.J. Herrero, and R.M. Escribano

Inst. Estructura de la Materia, CSIC, Molecular Physics, Madrid, Spain (rescribano@iem.cfmac.csic.es, +34 915855184)

The coexistence of solid methane and water ice has been observed in outer Solar System objects, in comets, and in interstellar ice mantles (1-3). CH_4 is proposed to be the starting point of rich organic chemistry in the astrophysical media. This work presents an investigation on ice mixtures of methane and water. The samples were analysed by infrared spectroscopy. In the range of temperatures spanned in this study our investigations provide evidence of the existence of a distorted CH_4 structure, characterized by an absorption band at 2900 cm^{-1}, corresponding to the symmetric stretch motion of the molecule, forbidden by symmetry in the pure solid. A quantification of the amount of distorted CH_4 trapped in the water ice structure, and its dependence on the ice generation procedure has been conducted. The CH_4:H_2O desorption energy has been determined. These and other findings will be discussed in the presentation.

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