

IR SPECTRA OF PHOSPHINE ICES.

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Phosphorus is an element of particular interest from the astronomical point of view, since it is an essential element for life. However, not many P-containing molecules have been found in space, both because a low cosmic abundance of P ($P/H \sim 3 \times 10^{-7}$) and because P is thought to be considerably depleted on dust grains. In particular, phosphine (PH_3), has only been observed in the atmospheres of Jupiter and Saturn, and, outside of the solar system, in the circumstellar envelope of IRC +10216.^a

Phosphine ice is thought to be a constituent of comets, and, in the ISM, a source for gas phase P upon sublimation from icy grains. In this work the infrared spectra of PH_3 ices and $\text{PH}_3:\text{H}_2\text{O}$ ice mixtures have been studied both experimentally and theoretically. PH_3 ices were generated by vapour deposition at 10 K.^b It was found that the amorphous to crystalline transition takes place between 35 and 40 K. A theoretical modelling of crystalline PH_3 and of a tentative amorphous PH_3 solid phase, as well as of amorphous $\text{PH}_3:\text{H}_2\text{O}$ ice mixtures, has been performed. The infrared spectroscopic information given in this work is expected to be useful for the detection and quantification of PH_3 in astrophysical ices.^c

^aM. Agúndez et al. 2014 ApJL 790 L27

^bB. Maté et al. 2021 ApJ 909 123

^cWork supported by the spanish Ministry of Science and Innovation (MCINN) through grant PID2020-113084GB-I00.