NH_3 reactions in ion-irradiated $H_2O + CO_2$ ices–in search of the identification of the 6.8 micron interstellar absorption band

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Attempts to fit the 6.8 micron feature observed in ISO SWS spectra such as NGC 7548 IRS9 and RAFGL 7009S using laboratory data have included a variety of species. Schutte et al. (1996) discusses candidates such as ices containing CH_3OH or NH_4+ ions but these alone can not explain the observed intensity. We have begun examining reactions between carbonic acid, H_2CO_3, and the base, NH_3, in search of new species which may contribute to the 6.8 micron feature. A layer of NH_3 ice is first formed under a layer of $H_2O + CO_2$. H_2CO_3 is formed in the $H_2O + CO_2$ ice layer during irradiation (Moore and Khanna, 1991). During slow warming the NH_3 diffuses through the upper layer containing the carbonic acid. Our first major result was the formation of a new residual ice above 250 K which is tentatively identified as carbamic acid (NH_2COOH) (Khanna and Moore, 1998). This compound has not been isolated or characterized by any other experimental technique. The spectrum of carbamic acid is a good match with the 6.8 micron band, but because it also contains a strong 7.7 micron band, it will not be a good candidate for the interstellar features. However, the acid is important because of the existence of its CN bond; structurally it has similarities with glycine, the simplest amino acid.

References:

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