FIRST DETECTION OF DOUBLY DEUTERATED SULFIDE

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Deuterium-bearing molecules have become the target of many observations in recent years and several models have been developed to account for them. More than twenty such molecules have been detected to date in interstellar clouds. The interest in this topic lies in the unusual chemistry at work in the cold regions where CO is apparently strongly depleted and in the general question of how much deuterium is trapped in the cold, dense phase of the ISM.

The study presented here was carried out with using the Caltech Submillimeter Observatory and presents the observational study of HDS and D_2S towards a sample of Class 0 sources, pre-stellar cores and dense cores. I report the first detection of the doubly deuterated sulfide in two dense cores and analyze the chemistry of these molecules aiming to understand the deuteration processes in the interstellar medium. The observed values of the D_2S/HDS ratio and the upper limits require an atomic D/H ratio in the acreting gas of 0.2 - 1. This high value is consistent with the prediction of a recent gas-phase chemical model that include H_2D^+, D_2H^+ and D_3^+ (Roberts et al., 2003).

This work supports the hypothesis that formaldehyde, methanol and sulfide are indeed formed onto the grain surfaces, during the cold pre-stellar core phase, where the CO depleted gas possess large atomic D/H ratios.