VUV photodesorption of H_2S ices

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Hydrogen sulfide (H_2S), one of the most abundant sulfur-bearing species detected in the interstellar medium (ISM), can be considered a precursor to certain biochemical molecules. Within the dense clouds, the significant energetic source stems from the secondary vacuum ultraviolet (VUV) field generated by the interaction of cosmic rays with molecular hydrogen. Oba et al. (2018) conducted measurements of chemical desorption caused by H atom incidents and speculated that it should surpass VUV photodesorption [1].

In this study, we investigated the VUV-induced desorption of H_2S ices and assessed the impact of structural factors by depositing ices at two different temperatures, 13 K and 70 K (both of which were subsequently irradiated at 13 K). Our findings indicate that amorphous H_2S ice deposited at 13 K exhibited a higher depletion cross-section and VUV-induced desorption yield compared to crystalline ice deposited at 70 K. Moreover, the VUV photodesorption yield of H_2S ice was influenced by both energy transfer length and surface purity of H_2S [2]. The VUV photodesorption yield measured in this study was found to be comparable to the chemical desorption yield measured through hydrogenation, especially when both values are applied to simulate conditions in dense cloud environments.

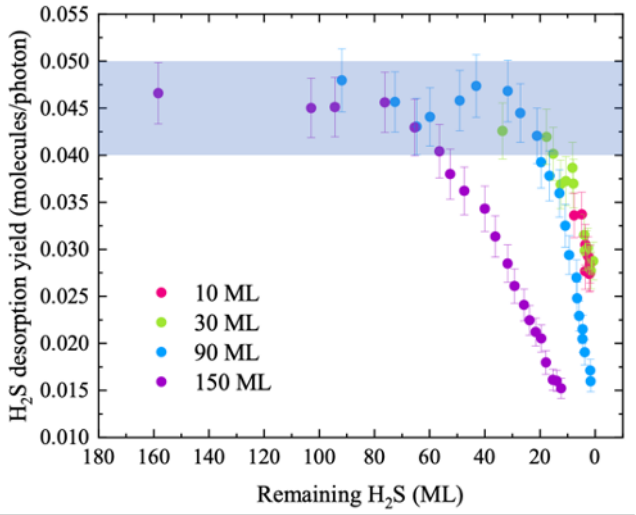

Figure 1: VUV photodesorption yield for different initial column densities as a function of remaining column density of H_2S ice.

References

[1] Y. Oba, T. Tomaru, T. Lamberts et al., 2018, Nat Astron 2, 228.
[2] N.-E. Sie, G. M. Muñoz Caro, Z.-H. Huang et al., 2019, ApJ 874, 35.