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# Production of complex bio-molecules in collapsing interstellar cloud

**Kinsuk Acharyya[1,2], S.K. Chakrabarti [3,2], S. Chakrabarti [2] and Ankan Das[2]**

[1]Leiden Observatory, Leiden University, Postbus 9513, 2300 RA Leiden, Netherlands
email: acharyya@strw.leidenuniv.nl

[2]Centre for Space Physics, 43 Chalantika, Garia Station Rd. Kolkata, 700084, India
[3]S.N. Bose National Centre for Basic Sciences, JD Block, Salt Lake, Kolkata, 700098, India

**Abstract.** We present step by step production of biologically important complex molecules in the interstellar medium. We considered grains of different size distributions. We then solve the Master equation for small grains and Rate equation for grains of larger size to obtain the abundance of molecular hydrogen on grains and their desorption to gaseous phase. We then studied the molecular hydrogen formation in a collapsing molecular cloud. Activation barrier energies for desorption of $H$ and $H_2$ and hopping rate for $H$ are taken from recent experimental results. We found that the production of molecular hydrogen is very much dependent on the cloud temperature since molecular hydrogen formation on grains are very much temperature sensitive. For clouds with grain temperature more than $25^o$K it is difficult to produce significant amount molecular hydrogen during the life time of molecular cloud. In a collapsing cloud only in a small temperature range adequate formation of $H_2$ is possible and in the rest of the collapsing phase molecular hydrogen formation is very small. We also use the Monte-Carlo simulation to form $H_2$ on grains and compute recombination efficiency and its dependence on the number of grain sites. We then continue to compute the production rate of more complex molecules by including a large number (422) of chemical species in a reaction network, and using updated reaction rates. The cloud models have been chosen to be stationary as well as non-stationary. In the later cases we do hydrodynamic simulations and couple the result with chemical evolution. We constructed a model study the possibility of glycine formation in the interstellar medium keeping in mind that present debate of detection of glycine in molecular clouds. We choose two gas phase pathways to form glycine formation: first one is through ion molecule reactions between protonated amino-alcohols and formic acid and in a second process we consider reaction between protonated hydroxyl-amine and acetic acid to produce protonated glycine. We considered the typical reaction rates for formation processes. Our results indicate that by the time collapse and star formation occurs, a significant amount of glycine can form and we believe that it could be detectable.

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