Theoretical studies of possible routes for the synthesis of amino acids in space

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One of the most interesting debates in interstellar chemistry concerns the possibility of finding biomolecules in astronomical sources. Among them, amino acids are of particular relevance in Astrobiology. It has been argued that interstellar amino acid formation could precede the syntheses of more complex molecules. In particular the search for interstellar glycine, the simplest amino acid, has been a recurrent subject in recent years. However, despite several radioastronomical searches, no conclusive identification of glycine has been possible so far. Nevertheless, the recent detection in space of related molecules such as amino acetonitrile, has prompted the search for interstellar glycine. In addition, experimental studies [1] have shown that precursors of glycine and alanine can be formed under laboratory conditions by the gas-phase reactions of protonated and ionized hydroxylamine with acetic and propanoic acids.

Within this context computational studies can be valuable to ascertain whether there are plausible and efficient synthetic routes toward interstellar glycine. Different theoretical studies [2,3] on these and related processes have been carried out in recent years to evaluate their feasibility under interstellar conditions. In the present communication we will present a theoretical study of different ion-molecule processes which have been proposed as possible routes toward the synthesis of precursors of glycine in the interstellar medium. Reactions involving chemical species such as acetic acid, formic acid, hydroxylamine, and ammonia derivatives, all of them of astrophysical significance, are considered.

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