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FORMAMIDE-BASED PREBIOTIC CHEMISTRY OF NUCLEOBASES AND AMINO ACIDS

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One of the main challenges in re-establishing the conditions in which life is supposed to have originated is the generation of precursors in an abiotic environment. Understanding the formation of biogenic molecules in abiotic conditions is a prerequisite in the origin-of-life studies. Determining the conditions allowing an efficient one-pot synthesis of the largest possible panel of biogenic compounds may shed light on the plausible scenario in which the processes that started life might have occurred. The formamide-based synthetic system proved to be particularly robust. This idea has been supported by the detection of sufficient amounts of formamide in the interstellar regions with dense molecular clouds and in the process of formation of new stars. We report experiments describing the syntheses taking place from formamide. Large panels of different compounds were observed after standard and microwave heating – nucleobases (adenine, cytosine, uracil), amino acids (glycine, alanine), hypoxanthine, pterine, purine, urea and urocanic acid. To study the potential mechanisms of the reactions leading to nucleic bases and amino acids high-level ab initio quantum chemical methods (MP2 and SCS-MP2) were used.

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