AMINO-ACIDS SYNTHESIS IN AQUEOUS MEDIA UNDER ULTRASONIC IRRADIATION

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In 1953 a graduate student, Stanley Miller, and his professor, Harold Urey, performed an experiment that proved organic molecules could have spontaneously formed on Early Earth from inorganic precursors. The now-famous "Miller-Urey experiment" used a highly reduced mixture of gases - methane, ammonia and hydrogen – to form basic organic monomers, such as amino acids, bricks of life, and could somehow give a plausible hypothesis about beginning of life.1 Since then, several methods have tried to reproduce the synthesis of amino-acids under unusual conditions such as UV irradiation of "dirty" ice from the pole2 or the bombing of graphite targets with high energy molecular jets.3 Whatever the used methods, all authors agreed that the formation mechanisms of amino-acids under such conditions is of radical origin.2-4 Therefore, sonochemistry may also be a powerful tool to access to the synthesis of amino-acids. Indeed, ultrasound is known to enhance some processes through a physical phenomenon called cavitation, which are the formation, growth and collapse of bubbles in an elastic liquid. By imploding, these bubbles creates local high pressure (up to 1000 bars) and temperature (up to 5000K) that leads to high energy radical mechanisms with some physical effects such as micro-mixing, mass transport or reduction of particles size.[5]

In the present study, we present the synthesis of some elementary amino-acids under ultrasonic irradiation in aqueous medium. The effects of several experimental parameters such as incident ultrasound frequency, temperature, nature and concentration of initial reactants, reaction time and acoustic energy are explored and presented.

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