What could Cavitation contribute to the Synthesis of Biomolecules on Primordial Earth?

Natan Kelson, David Furman and Yehuda Zeiri

ABSTRACT

Large scale reactive molecular dynamics (RMD) simulations were used to examine possible contribution of cavitation to the synthesis of biologically important organic molecules in primordial earth. The study examined a wide range of atmospheric compositions that are assumed to exist in primordial earth atmosphere. In all cases it was found that the extreme conditions that develop in the collapsing bubble leads to a complex scheme of reactive events. A large number of biologically important organic molecules were identified during the bubble collapse process including some nucleic acids. The life time of most intermediates is rather short, hence, they are not detected at the end of the cavitation process. Once the system cooled down to ambient conditions, a variety of organic molecules with biological importance were observed. In addition, the simulations suggest that cavitation may have contributions to the change of atmospheric composition and the increase of concentration of reduced species such as ammonia. The RMD simulations seem to be a very valuable tool to assist experimental research by the study of the various synthesis mechanisms and to predict stable intermediates that might be possible to detect experimentally.