

High-pressure torsion and the origin of life

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Impact by astronomical objects such as meteoroids, asteroids and comets is considered as a possible pathway for the delivery of essential molecules required for life to the Earth in about four billions years ago. Survival of organic molecules during impacts, their decomposition to reactive species or their polymerization to complex molecules such as protein and RNA could contribute to the appearance of early life on the earth. In this study, we introduce the high-pressure torsion method as a new platform to simulate astronomical impacts in a miniature scale. The significance of pressure and shear stress in the impact events is simulated, and it is found that organic molecules can show new transformations under the simulated conditions. New justifications for some astronomical phenomena reported in comets or on the Earth are suggested. The current study not only shows that the high-pressure torsion method has high potential to provide new insights into the origin of life, but also introduces a pathway to synthesize some biomaterials.