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Biomolecular systems under pressure

A. Katrusiak[1], M. Aniola[1], K. Dziubek[1], K. Ostrowska[1], E. Patyk[1]
[1]*Adam Mickiewicz University, Department of Materials Chemistry, Poznan, Poland*

Biological systems are often regarded as the ultimate goal of all knowledge in this respect that they can provide the clue for understanding the origin of life and the means for improving the life conditions and healthcare. Hence the interest in high-pressure behavior of organic and biomolecular systems. Such simple organic systems were among the first structural studies at high pressure at all. They included chloroform by Roger Fourme in 1968 [1] and benzene by Piermarini et al. in 1969, still with the use of photographic technique. The efficient studies on bio-macromolecular crystals had to wait for several decades till synchrotron radiation became more accessible and Roger Fourme again stood in the avant-garde of these studies [2]. At the turn of centuries his innovations in the laboratory equipment and experimental setup let him exploring high-pressure conformations of proteins, viral capsids and the double-helix molecular architecture in nucleic acids. These directions of high-pressure studies are continued for simple and macromolecular systems of biological importance. Recently new surprising facts were revealed about the compression of urea, sucrose, and other organic compounds, as well as of macromolecular crystals. Sugars are the main energy carriers for animals as well as building blocks in the living tissue, they are also ideal models for studying pressure-induced changes of OH···O and CH···O interactions. Different types of transformations occur in compressed urea, the first organic compound synthesized in laboratory. Hen egg-white lysozyme was investigated at moderate pressure in a beryllium vessel and the compression of both tetragonal and orthorhombic modifications were measured to 1.0 GPa in a DAC; the high-pressure structure of the tetragonal form was determined and refined at still higher pressure by Fourme et al. [3] Can high pressure provide information about the remarkable polymorphism of lysozyme?

[1] *R. Fourme, J. Appl. Cryst., 1968, 1, 23-30,* ***[2]*** *R. Fourme, R. Kahn, M. Mezouar, et al., J. Synchrotron Rad., 2001, 8, 1149-1156,* ***[3]*** *R. Fourme, E. Girard, R. Kahn, et al., High-Pressure Crystallography, Eds.: A. Katrusiak, P.F. McMillan, Kluwer, Dordrecht, 2004, 527-542*

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