

Measurement of the Isothermal Compressibility of Hydrated Myoglobin by Small-Angle Neutron Scattering

C. Loupiac

UMR 12 CNRS Laboratoire Léon Brillouin DSM/DRECAM,, CEA de Saclay, Gif-sur-Yvette, France

M. Bonetti^S

DSM/DRECAM Service de Physique de l'Etat Condensé, CEA de Saclay, Gif-sur-Yvette, France

S. Pin

CNRS Service de Chimie Moléculaire DSM/DRECAM, CEA de Saclay, Gif-sur-Yvette, France

P. Calmettes^C

UMR 12 CNRS Laboratoire Léon Brillouin, CEA de Saclay, Gif-sur-Yvette, France

Small-angle neutron scattering experiments were carried out at room temperature on pD 6.6 solutions of horse heart azidometmyoglobin (MbN₃) at pressures up to 300 MPa. The measurements were performed using various concentrations of MbN₃ in order to determine the second virial coefficient of the protein solution and the actual radius of gyration of the protein. The results shows that the interactions between the macromolecules are always strongly repulsive, even if their magnitude decreases with increasing pressure, whereas the radius of gyration of the protein remains constant. This indicates that the compactness of MbN₃ is not altered by pressures up to 300 MPa. However it is possible that a molten globule forms at the highest pressures.

Taking advantage of the pressure-induced contrast variation of the protein these experiments allow the partial specific volume of MbN₃ to be determined as a function of pressure. Its value decreases by about 5.4% between atmospheric pressure and 300 MPa. In this range the isothermal compressibility of hydrated MbN₃ is found to be $(1.6 \pm 0.1) 10^{-4} \text{ MPa}^{-1}$ This result will be compared with those obtained by means of other techniques.

Reference: C. Loupiac, M. Bonetti, S. Pin & P. Calmettes, Eur. Jour. Biochem. 269 (2002) 4731-4737.