

Micro-Brillouin Scattering Study of Low Temperature Elastic Properties of Protein Crystals

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The analysis of the complete three-dimensional structure of protein requires preparation of a single protein crystal of high quality. The study of protein crystals has wide applications such as, modeling of three dimensional structures, investigating bioactivities, synthesizing new drugs. Since protein crystals contain a large amount of water molecules, the crystals may deform and damage during the dehydration such as, unwanted stresses, cracks, degradations in mosaicity etc. [1]. Special care needs to be taken in handling these crystals from being damaged both mechanically and chemically for any accurate measurements. Generally, protein crystals are cryopreserved for long term preservation. The vitrifying tendency of cryoprotective solutions on cooling is the important factor for successful cryopreservation of biological materials. In the present study, the behavior of elastic properties in hen egg white lysozyme (HEWL) crystals with cryoprotective agents is studied by using micro-Brillouin scattering over a wide temperature range. The micro-Brillouin scattering technique is the best solution for the measurement of the elastic properties in small size crystals [2, 3]. We employed well known glass forming liquid of glycerol which undergoes a glass transition around 185 K without crystallization even in slow cooling. The observed behavior of hypersonic acoustic phonons shows continuous increase of sound velocity with decreasing temperature and no abrupt jump of sound velocity due to crystallization observed.

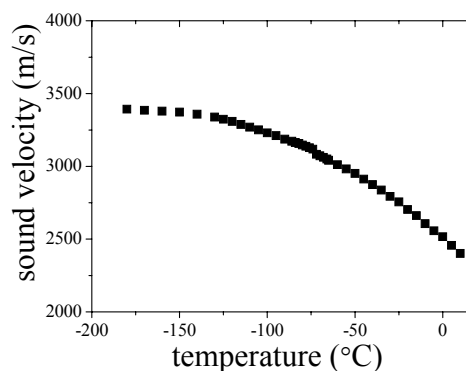
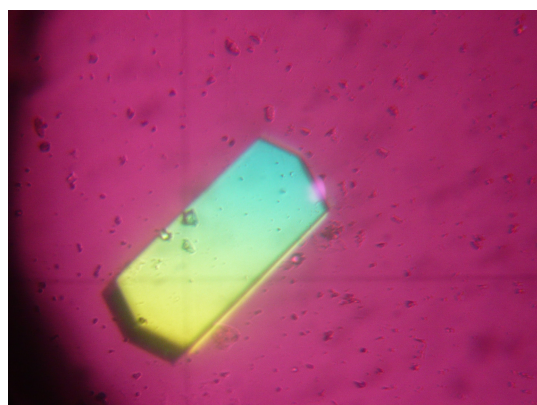


Fig. 1: Optical micrograph of a tetragonal HEWL crystal. **Fig. 2:** Sound velocity in a HEWL crystal in glycerol.

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