The First Observation of all Six Elastic Constants in Tetragonal Hen Egg-white Lysozyme Crystals

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It is interesting to investigate the elastic property of protein crystals. Previously, we have reported the longitudinal sound velocity of tetragonal hen egg-white (HEW) lysozyme crystals which are one of typical protein crystals using an ultrasonic pulse-echo method [1]. However, there is no measurement of all components of elastic constants, C_{ii} in tetragonal HEW lysozyme crystals since the measurements of transverse ultrasonic wave have not been carried out yet. In case of pulse-echo method, in order to generate a transverse ultrasonic wave in the crystals, a transducer must be in close contact with the crystal. However, hydrated protein crystals are fragile, and consequently, it was difficult to glue a transducer to a protein crystal. Recently, we found that the sound velocity increases with exposure to open air and approaches a constant value [2]. This suggested that the protein crystals became harder due to dehydration. Therefore, we have succeeded in the contact between a crystal and a transducer using dehydrated crystals. This led us generating a transverse ultrasonic wave through the dehydrated HEW lysozyme crystals at 42% relative humidity (RH). As a result, all components of elastic constants in dehydrated crystals were determined.

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