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Ultrasound and Hypersound Speeds in Lysozyme Solutions ALFONS SCHULTE, Department of Physics and College of Optics, University of Central Florida, Orlando, CHRISTIAN PRUNER, EMMERICH WILHELM, AUGUSTINUS ASENBAUM, Department of Materials Science and Physics, University of Salzburg, A-5020 Salzburg — Ultrasound velocimetry and Brillouin spectroscopy provide information on the compressibility of proteins and the surrounding hydration layer. Employing both techniques we investigate the sound speeds at GHz (hypersound) and MHz (ultrasound) frequencies in lysozyme solutions (250 mg / ml, pH 7) and pure water over the temperature range from 275 K to 335 K. Compared to water the Brillouin peaks in the lysozyme solutions are shifted by about 400 MHz towards higher frequencies. This shift reflects the change in sound speed and is attributed to the influence of the compressibility of the protein and bound water in the hydration shell. In addition, we measure a dispersion of the sound velocity in the lysozyme solution. The higher sound speed at GHz frequencies, as measured by Brillouin scattering, may indicate additional relaxation processes as compared to pure bulk water, where no sound dispersion between ultrasound speed and hypersound speed is observed.

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