

Investigation of the elastic properties of amorphous polymers by using Frequency-Domain Brillouin light scattering

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We applied high-pressure Brillouin spectroscopy to study the mechanical properties of representative amorphous polymer [1,2]: poly-carbonate (PC), unplasticized poly-vinylchloride (uPVC), and poly-etherimide (PEI).

The pressure dependence of optical and elastic properties, such as refractive index, acoustic phonon velocity, and P-V equation of state, was obtained by measuring at both the forward symmetric and back scattering geometry up to about 11 GPa.

While PC and PEI sample showed TA and LA mode simultaneously above certain pressure, uPVC sample showed only a single LA mode, which limited our access to further mechanical information.

For PC and PEI samples, we successfully calculated Poisson's ratio, bulk modulus, shear modulus, and Young's modulus. Furthermore, we obtained the P-V equation of state by exploiting two different methods and they were in good agreement, which showed our data were reliable.

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