

Precise Optical Interferometry in Diamond Anvil Cell: Application to dielectric and equation-of-state studies

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In the past the technique of white-light interferometry in a diamond anvil cell proved to represent a reliable tool for measurements of pressure dependence of the optical dielectric function. We have re-examined the precision and accuracy of this technique and applied it to refractive-index studies on H₂O and other molecular and simple solids. We will show that this technique, when combined with fitting transmission spectra by the Airy function, allows precise measurements of weak dispersion effects in transparent materials, as well as determination of distance between diamond anvils at a submicron resolution. Additionally, application of the interferometry together with an image analysis of sample facilitated complete monitoring and control of pressure-volume-temperature conditions of studied H₂O ices. It will be shown that this method represents a promising tool for the determination of equations of state of optically transparent liquids and soft solids in a diamond anvil cell.