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Title:Terahertz spectroscopy on polymers: A review of morphological studies
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Abstract:Polymers typically show only low absorption in the far-infrared or terahertz (THz) frequency range and are thus often used as window or lens materials for THz spectroscopy and imaging systems. A comprehensive study of the far-infrared properties of polymers yet reveals that THz spectroscopy is a very convenient technology for the investigation of various material properties including the morphology. Here, we report the dielectric parameters refraction index n and absorption coefficient κ of various polymers determined by THz time-domain spectroscopy with a very high precision. The observed features are attributed to macromolecular origin. Furthermore, we show that the temperature-dependent lattice mode shifts of highly-crystalline polymers reveal information about thermo-morphological interactions between the amorphous and the crystalline phase. A temperature-dependent refractometric data base of various standard polymers completes the paper. This data base enables the determination of the glass transition temperature Tg of these polymers and allows the extrapolation of the index of refraction across a broad range of temperatures above and below Tg for a given material.
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