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Title:Optical parameters of ZnTe determined using continuous-wave terahertz radiation
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Abstract:The optical parameters of three ZnTe crystal wafers of different thicknesses were determined using transmittance measurements of continuous-wave terahertz radiation from a two-color photomixing source. The parameters are extracted by fitting the transmittance data with theoretical curves generated using a Drude-Lorentz dielectric model of the crystal and a bootstrap statistical analysis of the fits. Sample specific properties such as the plasma, collision, and phonon damping frequencies were determined and used for an approximate calculation of carrier concentration. The results are compared with a comprehensive review of earlier values from the literature. Our results are consistent with previous work, falling within the spread of accepted values, and demonstrate that this method is particularly suited for determining the low and high frequency dielectric constants of semiconductor samples.
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Inspec controlled terms:carrier density - optical constants - permittivity - phonons - statistical analysis - terahertz wave spectra - wide band gap semiconductors - zinc compounds
Uncontrolled terms:optical parameter - continuous-wave terahertz radiation - crystal wafer - transmittance measurement - two-color photomixing source - transmittance data - Drude-Lorentz dielectric model - bootstrap statistical analysis - dielectric constant - transverse optical phonon frequency - plasma frequency - collision frequency - phonon damping frequency - carrier concentration - temperature 293 K to 298 K - ZnTe
Inspec classification codes:A7820D Optical constants and parameters (condensed matter) - A7870G Microwave and radiofrequency interactions with condensed matter - A7720 Dielectric permittivity - A6320 Phonons and vibrations in crystal lattices - A7220 Electrical conductivity phenomena in semiconductors and insulators
Numerical data indexing:temperature 2.93E+02 2.98E+02 K
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