Nanocomposites and nanomaterials

IR temperature dependent dielectric permittivity of the diphosphides – materials for the new generation of the infrared solar converters

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Producing of clean energy and increasing of the efficiency of corresponding photovoltaic technologies is one of the principal challenges of modern time. Another big challenge is reducing costs and toxicity of the mass deployment of solar cells. Diphosphides are promising materials for new generation of the infrared converter systems [1]. They also found to be less toxic than other materials presently used in non-Si based solar cells therefore mass deployment of solar cells based on diphosphides would be more environment friendly and less expensive [2]. These issues attract our attention to study the optical properties of diphosphides in the IR at different temperatures.

In this study we report on the dielectric permittivity of ZnP_2, CdP_2 and $ZnGeP_2$ in the IR at the temperature range 4-300K. The dielectric permittivity is presented in the framework of the Drude–Lorentz model containing both plasmon and phonon contributions for two polarizations of incident light [3-5]. Temperature dependence of the parameters of Lorentz oscillator model and their influence on the imaginary dielectric permittivity dispersion is discussed. Optical phonon behaviors are ascribed to thermal expansion of the lattice.

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