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POLARITONS EXCITATED IN ZnO CERAMICS

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The report presents the results of studies on surface phonon and plasmon-phonon polaritons in undoped and manganese-doped ZnO ceramics for E ⊥ c the orientation.
The authors obtained mathematical expressions for calculating the reflectance coefficient in the Attenuated Total Reflectance (ATR) spectra for undoped and manganese-doped ZnO ceramics in the frequency range of surface polariton (SP) excitation. Programs were developed to model and perform a dispersion analysis of the ATR spectra of the ZnO ceramics. Based on a quantitative analysis of the experimental and calculated spectra, the conditions under which experimental study of SP is possible were determined.
For the dispersion analysis of ATR spectra, a single-oscillator mathematical model was used, which additively accounts for the contribution of the phonon and plasmon subsystems to the dielectric permittivity of the ZnO ceramics. The calculations were performed for undoped and Mn-doped ZnO ceramics with different free carrier concentrations. In the frequency range between the transverse and longitudinal optical phonons of the ZnO ceramics, the theoretical and experimental dispersion dependencies and damping coefficients were investigated.
It is shown that the SP spectra for undoped and (manganese) doped ZnO ceramics are well modeled using mutually consistent parameters obtained by the authors for zinc oxide single crystals with orientation E ⊥ c. This demonstrates the possibility of determining the optical and electrophysical parameters of ZnO ceramics (refractive index and absorption coefficient, plasma frequency and damping coefficient, etc.).

Type of presence

Presence at Taras Shevchenko National University

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