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Excitonic spectra and energy band structure of $ZnAl_2Se_4$ crystals

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Abstract

Absorption, reflection and wavelength modulated reflection spectra were investigated in $ZnAl_2Se_4$ crystals. The energy positions of ground and excited states for three excitonic series (A, B and C) were determined. The main parameters of excitons and more precise values of energy intervals $V_1(\Gamma_7)–C_1(\Gamma_6)$, $V_2(\Gamma_6)–C_1(\Gamma_6)$, and $V_3(\Gamma_7)–C_1(\Gamma_6)$ were estimated. Values of splitting due to crystal field and spin–orbital interaction were calculated. Effective masses of electrons ($m_{C1}*$) and holes ($m_{V1}*$, $m_{V2}*$, $m_{V3}*$) were estimated. Reflection spectra contours in excitonic region were calculated using dispersion equations. Optical functions for $E > E_g$ from measured reflection spectra were assigned on the base of Kramers–Kronig relations.

Keywords: chalcogenide semiconductors compounds, excitons, band structure, reflection and transmission spectra, Kramers–Kronig analysis

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Optical Materials
Volume 49, November 2015, Pages 319-324

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