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Optical constants of $\text{Hg}_x\text{Cd}_{1-x}\text{Te}$ alloys

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Author(s): Djurusic, A.B.

Inst. fur Angewandte Photophys., Tech. Univ. Dresden, Germany

Rakic, A.D.; Tmusic, R.; Li, E.Herbert; Majewski, M.L.

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ABSTRACT

Optical constants of $\text{Hg}_x\text{Cd}_{1-x}\text{Te}$ alloys are modeled for the first time over the spectral range from 1.5 eV to 6.0 eV for all compositions $0 \leq x \leq 1$. The employed model is the modified Adachi's model, which utilizes variable broadening instead of the conventional Lorentzian one. The model takes into account transitions at critical points E_0 , $E_0 + \Delta_0$, E_1 , $E_1 + \Delta_1$, E_0' , $E_2(X)$, and $E_2(\Sigma)$, as well as excitonic effects at the lowest four critical points. Model parameters are determined using a global optimization routine, namely an acceptance-probability-controlled simulated annealing algorithm. Excellent agreement with the experimental data is obtained in the entire investigated energy and composition ranges.

INDEX TERMS

• IEEE Terms

Absorption , Dielectrics , Electrooptic effects , Gold alloys , Mercury (metals) , Optical refraction , Oscillators , Photonic band gap , Spectroscopy , Tellurium

• INSPEC

◦ Controlled Indexing

II-VI semiconductors , cadmium compounds , dielectric function , excitons , mercury compounds , optical constants , simulated annealing

◦ Non Controlled Indexing

HgCdTe , exciton , global optimization , modified Adachi's model , optical constants , simulated annealing , variable line broadening

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