EPR of Mn^{2+} and Eu^{2+} in PbTe Thin Films Grown by Laser-assisted Deposition Technique

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Electron paramagnetic resonance (EPR) of Mn^{2+} and Eu^{2+} in thin films PbTe and also crystal structures of films grown by laser-assisted deposition technique (LAD) on different substrates at relatively low temperatures (T = 293-573 K) are analyzed. The investigations of EPR indicated to verify the crystalline quality of IV-VI layers. In the layers deposited from the Pb(Ge)Te : Mn and PbTe : Eu targets, measurements of the EPR spectra with the orientation of the magnetic field perpendicular to the layer surface exhibited satellite lines near each HFS line ($\Delta H \cong 4.5$ Oe), caused by superhyperfine interaction (SHFI) of Mn^{2+} $3d^5$ and Eu^{2+} $4f^7$ electrons with the nuclear moments of ^{125}Te and ^{153}Te in the first coordination shell. In this case the SH parameters are the next:

PbTe : Mn – $g = 1.9975 \pm 0.0005$, $A = (59.9 \pm 0.2)\cdot 10^{-4}$ cm^{-1}, and $a_{Te} = (15.8 \pm 0.2)\cdot 10^{-4}$ cm^{-1}, PbTe : Eu – $g = 1.997510 \pm 00055$, $b_4 = (40.1 \pm 0.45)\cdot 10^{-4}$cm^{-1}, $b_6 = (-0.63 \pm 0.45)\cdot 10^{-4}$cm^{-1}, $A = (27.0 \pm 0.45)\cdot 10^{-4}$cm^{-1}, $a_{Te} = (11.8 \pm 0.45)\cdot 10^{-4}$cm^{-1} for the ^{151}Eu isotope, $A = (11.9 \pm 0.45)\cdot 10^{-4}$cm^{-1} for the ^{153}Eu isotope.

where a_{Te} is SHFI constant.

Due to the heavy overlap of the EPR lines, the value of the SHFI constant for the ^{153}Eu isotope can't be determined. The ratio of the HFI constants, A(^{151}Eu)/A(^{153}Eu) obtained from the experimental data is equal to the ratio of the nuclear magnetic moments for these isotopes.