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Raman scattering in $Zn_{1-x}Fe_xTe$, a van Vleck diluted magnetic semiconductor[1] X. LU, S. TSOI, I. MIOTKOWSKI, S. RODRIGUEZ, A.K. RAMDAS, Purdue University, H. ALAWADHI, Sharjah University, UAE, T.M. PEKAREK, University of North Florida — $Zn_{1-x}Fe_xTe$, a zinc blende II-VI diluted magnetic semiconductor(DMSs), exhibits van Vleck paramagnetism, thanks to the electronic level structure of Fe^{2+} with T_d site symmetry, Subjected to crystal field and spin-orbit coupling, the lowest level of its ground state multiplet has a Γ_1 non-magnetic level, with a Γ_4 magnetic level just above it. This level ordering leads to its van Vleck paramagnetism. The Raman spectra of this DMS display the $\Gamma_1 \rightarrow \Gamma_4$electronic transition($\Gamma^*$) whose Zeeman splittings are interpreted in terms of symmetry considerations and numerical calculations. The magnetic field and the temperature dependence of the spin-flip Raman line of the donor-bound electron in $Zn_{1-x}Fe_xTe$ exhibit characteristics typical of van Vleck paramagnetism and, in combination with magnetization measurements, yield the s-d exchange constant αN_0=236.9±9 meV. The Raman spectra also show Γ^* in combination with LO phonons which exhibit an intermediate mode behavior.

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