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FINE STRUCTURE IN EXCITON-MAGNON BANDS IN Mn^{2+} MAGNETS

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ABSTRACT

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This thesis deals with the ${}^6A_{1g}({}^6s) \rightarrow {}^4T_{2g}({}^4D)$ Mn^{2+} transitions in antiferromagnetic $RbMnF_3$ ($T_N = 82.6^{o}K$) compound. Fine structure at low temperature was observed in the D-band of $RbMnF_3$ compound. Tentative assignments of this fine structure are discussed by examining the exchange interaction mechanism, spin wave side bands (i.e. exciton-magnon absorption), vibronic mechanism, and spin-orbit interaction (L-S). The analysis shows that The exchange interaction mechanism plays an important role in the appearance of the fine structure in the D-band. The shift in the line position of the D-band can be quantitatively understood by considering the effect of the exchange interaction between the adjacent Mn^{2+} ions. The disappearance of the fine structure peaks in the D-band above T_N was explained in terms of spin disorder and the lack of exchange interaction between neighboring Mn^{2+} ions. The temperature dependence of the D-band in $RbMnF_3$ above T_N proves that this band is an exciton-magnon band in nature.