A μSR and X-ray diffraction study on the layered-perovskite vanadium oxide Sr_2VO_4

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The layered-perovskite vanadium oxide, Sr_2VO_4, is attracting renewed interest as a candidate compound showing orbital or magnetic octupole order at T_s ~ 100 K [1,2]. We investigated the electronic ground state of Sr_2VO_4 by combined use of μSR and x-ray diffraction (using synchrotron radiation) to identify the correlation between magnetic and structural properties, where a special precaution was taken to the possible sample dependence of the electronic properties. We have found that zero-field (ZF-) μSR spectra at 80 K and 300 K (i.e., below and above T_s) exhibit depolarization described by the Kubo-Toyabe function. This indicates that no long range magnetic order is present around T_s, suggesting that the effect of *d* electron moments is eliminated by the fast fluctuation over the relevant temperature range. It has been confirmed by x-ray diffraction measurements on the same sample that structural transition occurs at T_s, although certain qualitative difference from a earlier work is observed. Meanwhile, ZF-μSR time spectra exhibit fast depolarization below ~ 10 K, where the depolarization is reproduced by a sum of two exponential decay. We also made longitudinal-field (LF-) μSR experiments and found coexistence of static and dynamical internal fields with broad field distributions. The LF-μSR measurement was extended down to 30 mK and we observed the fluctuating internal field even at the lowest temperature. These findings are qualitatively similar to the result of recent μSR study[3]. In this presentation, we discuss the origin of low temperature magnetism in view of structural transition around T_s.

References

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