

## Spin lattice relaxation of proton NMR in Mn formate di-urea single crystal at low temperatures

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We have performed pulsed NMR experiments on the nuclear spins of proton in Mn formate urea of a single crystal,  $\text{Mn}(\text{HCOO})_2 \cdot 2(\text{NH}_2)_2\text{CO}$  in the temperature range between 1.4 K and 4.2 K. Below the Neel temperature ( $T_N=3.78$  K), the temperature dependence of spin lattice relaxation time ( $T_1$ ) of proton NMR has been studied[1]. The  $T_1$  increases slightly as the temperature decreases from 2.1 K and it becomes a maximum value of 6.5 ms at 1.95 K. After that, it decreases as the temperature decreases. At around 1.68 K, it reaches a minimum and again increases with decreasing temperature. The intensity of spin echo signal shows also a minimum at the temperature where  $T_1$  becomes the smallest value. Because half of moments of  $\text{Mn}^{2+}$  electronic spins are paramagnetic below  $T_N$ , these results suggest that the re-entrant phase transition may occur at around 1.68 K [2].

[1] K. Takeda, H. Deguchi, T. Hoshiko and K. Yamagata: J. Phys. Soc. Jpn, Vol.58, No.10, (1989) 3489.

[2] H. Kubo, K. Zenmyo, M. Matsumura, K. Takeda, K. Aihara and K. Yamagata: J. Phys. Soc. Jpn, Vol.68, No.1 (1999) 253.