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Magnetic Hyperfine Interaction of ^{59}Fe in Nickel

The nuclear magnetic resonance on oriented nuclei (NMR-ON) is a powerful method for investigating the hyperfine interactions of probe nuclei in ferromagnetic metals. A systematic study of the hyperfine fields gives us very important information on the electronic structures of the elements in ferromagnetic host metals. Previously, we reported successful measurement hyperfine field of ^{59}Fe in iron host [1], and nuclear spin-lattice relaxation time [2]. We measured the hyperfine field and nuclear spin-lattice relaxation time of ^{59}Fe in nickel host using β -ray detected NMR-ON method. The sample of $^{59}\text{FeNi}$ was produced by irradiation of $^{58}\text{FeNi}$ foil with thermal neutrons. After irradiation the sample was annealed at 800°C in vacuum for 1 hour. The NMR-ON experiment was performed by 3He/4He dilution refrigerator at Niigata University. The sample was cooled down to about 10mK. The asymmetry of β rays was monitored by two Si detectors mounted at 0° and 180° with respect to the orientation axis. The resonance spectra were measured at external field $B_0 = 0.1, 0.2, 0.4,$ and 0.6 T. From the linear shift of resonance frequencies with external field B_0 , we obtained $\nu_0 = 48.34(1)$ MHz. The magnetic moment of ^{59}Fe was reported as $\mu = -0.3358(4)$ μ_N [1]. Using this value and neglecting a possible Knight shift, the hyperfine field of FeNi was deduced to be $B_{\text{HF}} = -28.33(5)$ T, which is in good agreement with the previously reported value of $28.2(2)$ T [2]. The nuclear spin-lattice relaxation time was also measured by turning FM on and off at the center of the resonance frequency. The further data analysis is in progress. References [1] T. Ohtsubo, D.J. Cho, Y.Yanagihashi and S. Ohya, Phys. Rev. C54, 554 (1996). [2] T. Ohtsubo, D.J. Cho, Y.Yanagihashi, K. Komatsuzaki, K. Mizushima, S. Muto and S. Ohya, Proceedings of the 10th International Conference on Hyperfine Interactions; Hyperfine Interactions (C), 577 (1996). [3] V.G. Bhide and G. K. Shenoy, J. Phys. Soc. Japan 21, 625 (1966).

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