

Neutron Scattering from the Ferromagnetic Metal CoS₂

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Inelastic neutron scattering experiments from the ferromagnetic metal CoS₂ have been performed in the ferromagnetic as well as paramagnetic states. Below T_C ($= 121$ K), sharp responses of the spin wave scattering in a small q region suddenly broaden at a boundary of (q_{SB}, ω_{SB}) . We speculate that the damping of spin wave comes from the merging into a Stoner continuum. The paramagnetic diffuse scattering is observed at T_C near the magnetic zone center. We analyzed the data by using a double Lorentzian form in q and ω . The linewidth Γ satisfies the relation of $\Gamma \propto q^{2.5}$. Above T_C , the dynamical scaling hypothesis $\Gamma = A_0 q^{2.5} f(\kappa_1/q)$, explains well the broadening of energy width observed in the paramagnetic diffuse scattering. We discuss how the itinerant character appears on A_0 and the scaling function. The dynamical feature over the wide temperatures indicates that CoS₂ is regarded as a typical itinerant ferromagnet, even though static measurements classify it as a nearly saturated narrow band ferromagnet.

KEYWORDS: CoS₂, inelastic neutron scattering, spin wave, Stoner excitations, dynamical scaling