Study of the spin wave dynamics of $Fe_{65}Ni_{35}$ by polarized SANS

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The spin wave dynamics in the invar $Fe_{65}Ni_{35}$ alloy was investigated in a wide temperature range 0 <T < T_C using the Inclined Geomery Method (IGM) in Polarized SANS. This method is based on the analysis of the left-right asymmetry of the magnetic scattering of polarized neutrons arising when the magnetization direction of the sample is *inclined* to the incident neutron wavevector. The spin wave scattering is concentrated mostly near the cut-off angle θ_C that depends on the magnetic field as: $\theta^2_C(H) = \theta^2_0 - g\mu H\theta_0/E$, where $\theta_0 = h^2/(2\ D\ m_n)$. In the vicinity of the cut-off angle, the scattering is smeared by the SW damping $\Gamma(q)$. The spin-wave (SW) parameters, such as the SW stiffness D and the SW damping Γ, are extracted by comparison of the antisymmetrical contribution to scattering with a model function. The temperature behaviour of the spin wave stiffness D is well described by the expression: $D \sim |\tau|^x$, where $\tau = 1 - T/T_C$ and $x = 0.48 \pm 0.01$ for the whole range $|\tau| > 0.1$. The SW dumping is well fitted by the formula $\Gamma_q = \Gamma_0\ q^2$. The value of Γ_0 does not depend on the temperature and is equal to 0.12 meV. We speculate how the SW dynamics of the system may be related to the invar anomaly in this classical Invar alloy.