Anomalous quasiparticle excitation in Li-intercalated layered superconductor Li_xZrNCl

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Li-intercalated superconductor, Li_xZrNCl, exhibits an anomalous character that the electronic specific coefficient in the mixed state increases rapidly with field and becomes close to the normal state value around a field much lower than the upper critical field (H_{c2}) [1]. This observation strongly suggests the occurrence of excess quasiparticle (QP) excitation induced by external field. We performed muon spin relaxation (μSR) experiment to clarify the origin of this anomalous QP excitation by investigating the behavior of superfruid density (n_s).

We found that the field dependence of muon spin relaxation rate (σ, proportional to n_s) is not consistent with a constant magnetic penetration depth (λ) independent of the external field (Fig. 1). Further analysis indicates that the slope of λ against field (η) is considerably large, which is comparable with those for anisotropic superconductors. In this contribution, we also report on the x dependence of n_s, and discuss the possible origin of the anomalous QP excitation.

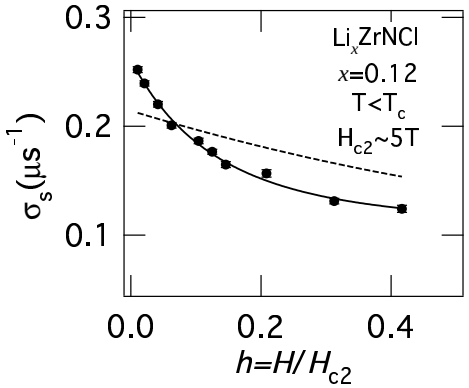

Fig. 1: Field dependence of Gaussian relaxation rate in the mixed state of $Li_{0.12}ZrNCl$. Curves are the result of fits by a model using $\lambda = \lambda(0)[1+\eta\cdot(H/H_{c2})]$ with η as a free parameter (solid) or $\eta = 0$ (dashed).

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