UPPER CRITICAL FIELD IN $LiTi_2O_4$

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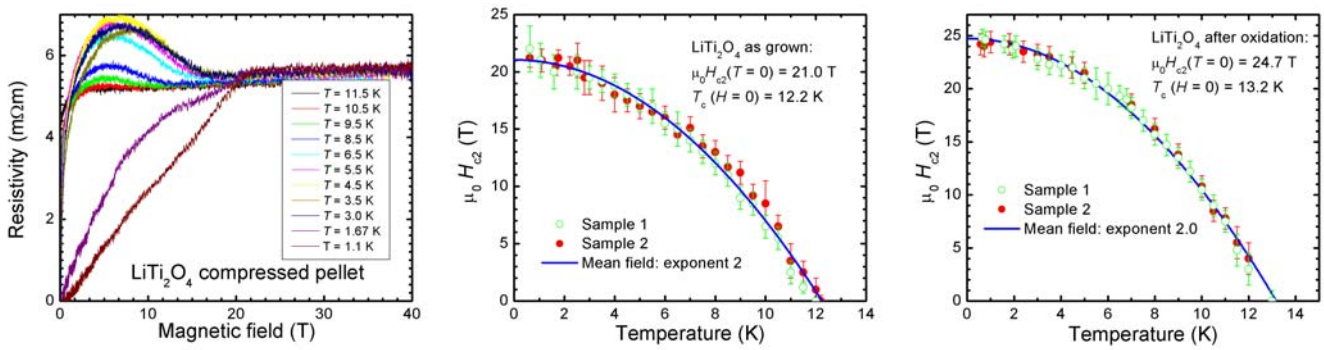
$LiTi_2O_4$ is a very interesting spinel superconductor. In spite of this, there is a very considerable spread in the upper critical fields ($\mu_0 H_{c2}$) reported in the literature; values (all by extrapolation) range from 8-35 T. In response to this issue, we have measured the resistivity of compressed pellets of $LiTi_2O_4$ microcrystals using pulsed magnetic fields at NHMFL-LANL. High-frequency lock-in techniques (current 1-11 μA, frequency ~50-200 kHz) were used to acquire the resistivity data (Fig. 1a). Field pulses to well above 33 T were needed to separate normal-state resistivity from dissipative vortex motion (humps, dips) in this granular superconductor.



(a) **(b)** **(c)**

Figure 1: (a) High-frequency lock-in measurements of the field-dependent resistivity of $LiTi_2O_4$ for several temperatures. Note that dissipative effects (vortex motion between grains) result in a mixed-phase resistivity that varies between a linear increase and a peak feature. (b) Upper critical field $\mu_0 H_{c2}$ versus temperature for two $LiTi_2O_4$ samples as grown; data are points, the curve is a mean-field fit with exponent 2. (c) Similar data and fit for the same two samples after controlled oxidization; note that the upper critical field and critical temperature T_c have increased.

The extracted values of $\mu_0 H_{c2}$ are shown for two as-grown samples in Fig 1b, and for the same two samples after controlled oxidation in Fig. 1. Note that the alteration of valence increases H_{c2} and the critical temperature T_c. The data are well fitted by a mean-field expression with exponent 2, suggesting that the superconductivity may be conventional, i.e. "BCS-like".

References

E.G. Moschopoulou, J. Singleton and P.A. Goddard, in preparation.