Thermal conductivity of pure and Zn-doped $LiCu_2O_2$ single crystals

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$LiCu_2O_2$ is the first example of Cu-based multiferroic material and is particularly attractive because of its one dimensional spin structure.[1] The competition between the nearest-neighboring ferromagnetic (FM) interaction and the next-nearest-neighboring antiferromagnetic (AF) interaction of Cu^{2+} spins in the spin chain leads to magnetic frustration and a spiral (helicoidal) magnetic order below ∼24 K.
We study the low-temperature thermal conductivity (κ) of pure and Zn-doped $LiCu_2O_2$ single crystals. The $\kappa(T)$ of pure $LiCu_2O_2$ single crystal shows a double-peak behavior, with two peaks locating at 48 K and 14 K, respectively. The different dependences of the peaks on the Zn concentration indicate that the high-T peak is likely due to the phonon transport while the low-T one is attributed to the magnon transport in the spin spiral ordering state. In addition, the magnetic field can gradually suppress the low-T peak but does not affect the high-T one; this further confirms that the low-T peak is originated from the magnon heat transport.

[1]S. Park, Y. J. Choi, C. L. Zhang, and S-W.Cheong, Phys. Rev. Lett. **98**, 057601 (2007).