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Field induced phase transition in layered honeycomb spin system
$\alpha$-RuCl$_3$ studied by thermal conductivity$^1$ IAN LEAHY, ALEX BORNSTEIN,
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CO 80309 — $\alpha$-RuCl$_3$, a quasi two-dimensional honeycomb lattice is known
to be a candidate material to realize the Heisenberg-Kitaev spin model of a highly
anisotropic bond-dependent exchange interaction. We investigate in-plane thermal
conductivity ($\kappa$) as a function of temperature ($T$) and in-plane applied field ($H$).
At $H = 0$, the onset of a strong increase in $\kappa$ marks the spontaneous long range or-
dering temperature, $T_c = 6.5$K, corresponding to zigzag antiferromagnetic ordering.
A broad peak appearing below $T_c$ in $\kappa$ was found to be suppressed significantly as
$H$ increases up to $\approx 7T$, implying the system undergoes a field-induced transition
from ordered to a new spin-disordered state analogous to the transverse-field Ising
model. Further increasing $H$ above $7.1T$, the large field seems to begin polarizing
spins thus increasing the phonon mean free path, resulting in a significant rise in
$\kappa$. This tendency is clearly shown in the field dependence of $\kappa$ below $T_c$, which has
a pronounced minimum at $H_{\text{min}} = 7.1T$. We will discuss our scaling analysis to
characterize this field-induced phase transition and compare to the transverse-field
Ising spin system.

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