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Competing Magnetic Interactions in Magnetoelectric YbMnO₃
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Wisconsin-Milwaukee, USA — The (*RE*)MnO₃ (*RE* = *Rare Earth*) series of mag-
netoelectrics exist as both hexagonal and orthorhombic lattice structures. These
have recently attracted much attention due to possible applications in spintronics,
in switching, and as media with negative refractive index. YbMnO₃ is hexagonal
with ferroelectricity ($T_c \sim 970\text{K}$) and antiferromagnetism (T_N : Mn $\sim 80\text{K}$, Yb $\sim 5\text{K}$)
in the same phase. Here, we report detailed studies of the H-T phase diagram using
a high-quality single crystal of YbMnO₃ grown by floating zone. We examine the
magnetically ordered phases of Yb: Yb³⁺ (2a) via Yb-Yb, and Yb³⁺ (4b) via Yb-
Mn interactions within the hexagonal YbMnO₃ structure, and report several new
features in the magnetic phase diagram. Contrary to recent reports, we observe
that the magnetic moment of Yb does not become fully suppressed with external
magnetic field, but rather directly transitions from the A₁ order into the A₂ order at
low temperature.

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