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Magnetic ground state in the frustrated Yb2-xNdxTi2O7 pyrochlore series

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Pyrochlore magnets ($R_2M_2O_7$), with rare-earth ions arranged on corner-linked tetrahedra, are key to understanding magnetic frustration. These systems display diverse magnetic behaviors, including spin ice and spin liquid. Recently, researchers are exploring exotic magnetism by chemically manipulating or diluting these spin systems. We present magnetization and neutron-scattering measurements on polycrystalline samples of the Yb2-xNdxTi2O7 series. We recently synthesized Yb2-xNdxTi2O7 using the standard solid-state reaction, and powder x-ray diffraction analysis confirms this series adopts the pyrochlore structure. Fits to the dc magnetic susceptibility data using a Curie-Weiss law reveal a ferromagnetic coupling between the magnetic moments. Our ac magnetic susceptibility measurements show a sharp peak below 0.5 K, indicating a long-range order magnetic transition. As the neodymium content decreases, the transition shifts to lower temperatures, and the peak broadens, suggesting changes in the ground magnetic state and spin-spin correlations. Our investigation on the ground magnetic state of this new series for the composition x = 1 is characterized through neutron diffraction experiments down to 50 mK, and the inelastic neutron scattering experiment further confirms the crystal-field level and the magnetic anisotropy of the magnetic ions.

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