

# Single Crystal Study of $S = 1$ Heisenberg Antiferromagnet $\text{NiGa}_2\text{S}_4$ on a 2D Triangular Lattice

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$\text{NiGa}_2\text{S}_4$  is a two-dimensional spin-1 antiferromagnet on an exact triangular lattice. Thermodynamic and neutron measurements on polycrystalline samples of  $\text{NiGa}_2\text{S}_4$  demonstrated the absence of long-range order down to 0.35 K well below the Weiss temperature  $\sim 80\text{K}$  [1].

Here, we report the magnetic properties of single crystals of  $\text{NiGa}_2\text{S}_4$ . The detailed magnetic measurements have revealed that  $S = 1$  spins on the triangular lattice are of the isotropic Heisenberg type. Thermodynamic measurements have confirmed the absence of long-range order or conventional spin glass ordering. The  $T^2$  dependent specific heat below 10 K, suggesting linearly dispersive modes in two dimensions, is insensitive to magnetic fields along both the in-plane and out-of-plane directions. The susceptibility below 10 K is nearly constant, and insensitive to both strength and direction of the magnetic field up to 7 T. These unusual magnetic properties suggest the realization of a novel spin state below 10 K in  $\text{NiGa}_2\text{S}_4$ .

[1] S. Nakatsuji, Y. Nambu, H. Tonomura, O. Sakai, S. Jonas, C. Broholm, H. Tsunetsugu, Y. Qiu, and Y. Maeno, *Science* **309**, 1697 (2005).