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S = 1 on a Diamond Lattice in NiRh2O4[1] JUAN CHAMORRO, TYREL MCQUEEN, Johns Hopkins University — An S = 1 system has the potential of rich physics, and has been the subject of intense theoretical work. Extensive work has been done on one-dimensional and two-dimensional S = 1 systems, yet three dimensional systems remain elusive. Experimental realizations of three-dimensional S = 1, however, are limited, and no system to date has been found to genuinely harbor this. Recent theoretical work suggests that S = 1 on a diamond lattice would enable a novel topological paramagnet state, generated by fluctuating Haldane chains within the structure, with topologically protected end states. Here we present data on NiRh2O4, a tetragonal spinel that has a structural phase transition from cubic to tetragonal at T = 380 K. High resolution XRD shows it to have a tetragonally distorted spinel structure, with Ni2+ (d8, S = 1) on the tetrahedral, diamond sublattice site. Magnetic susceptibility and specific heat measurements show that it does not order magnetically down to T = 0.1 K. Nearest neighbor interactions remain the same despite the cubic to tetragonal phase transition. Comparison to theoretical models indicate that this system might fulfill the requirements necessary to have both highly entangled and topological behaviors.

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