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Spin glassy behaviors and isolated spin dimers in $BaCr_{9p}Ga_{12-9p}O_{19}$ JUNJIE YANG, ANJANA SAMARAKOON, KYUN WOO HONG, SEUNG-HUN LEE, Department of Physics, University of Virginia, Charlottesville, VA 22903, USA, JOHN R. D. COPLEY, QINGZHEN HUANG, NIST Center for Neu- tron Research, Gaithersburg, Maryland 20899, USA, TAKU J SATO, IMRAM, Tohoku University, Katahira, Sendai 980-8577, Japan — Theoretical results suggested that quantum fluctuations may induce glassy states (spin jam states) in defect-free spin systems. Recently our experimental results indicated the existence of spin jam states in $SrCr_{9p}Ga_{12-9p}O_{19}$ (SCGO(p)) in which the Cr^{3+} ions form two-dimensional (2D) triangular lattice of bi-pyramids. Here we report a isostructural new system $BaCr_{9p}Ga_{12-9p}O_{19}$ (BCGO(p)) with $0.4<p<0.9$. Neutron diffraction results show that BCGO(p) is isostructural as SCGO(p) but with a larger $c$lattice indicating that BCGO(p) is more 2D. BCGO(p) exhibits similar glassy behaviors as SCGO(p) but with higher freezing temperature. Very high Curie-Weiss temperature and frustration index were also observed in BCGO(p) suggesting that BCGO(p) is one of the most frustrating system. Inelastic neutron scattering results show that BCGO(p) has dispersionless magnetic excitations at an energy of 16.5(1) meV arising from $4f_{vi}$-$4f_{vi}$ spin dimers. These spin dimers are adjacent spins in neighboring triangular lattice planes which separate the 2D interacting triangular lattice of bi-pyramids. These results indicate that BCGO(p) is a new good candidate for studying spin jam states.

Junjie Yang
Department of Physics, University of Virginia, Charlottesville, VA 22903, USA

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