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Evidence of frustration in the S=1/2 square-lattice antiferromagnet $Sr_2CuTe_{1-x}W_xO_6$ OTTO MUSTONEN, Aalto University, SAMI VASALA, ELISA BAGGIO-SAITOVITCH, Centro Brasileiro de Pesquisas Fisicas (CBPF), HELEN WALKER, ISIS Neutron and Muon Source, MAARIT KARPPINEN, Aalto University — The S=1/2 Heisenberg frustrated square-lattice model, or J_1-J_2 model, describes systems with competing antiferromagnetic interactions. Magnetic order is Néel type when $J_1 \gg J_2$ and columnar when $J_2 \gg J_1$. The nature of the ground state in the highly frustrated $J_2/J_1 \approx 0.5$ region is under debate with proposals including different valence bond solids and spin liquids. We report experimental evidence of frustration in a tunable J_1-J_2 model system. Recent neutron scattering experiments by us [1] and ref. [2] have shown the Cu^{2+} square-lattice double perovskites Sr_2CuTeO_6 and Sr_2CuWO_6 to be highly two-dimensional antiferromagnets with $J_2/J_1 = 0.03$ (Néel order) and $J_2/J_1 = 7.92$ (columnar order), respectively. We have synthesized the solid solution series $Sr_2CuTe_{1-x}W_xO_6$ $0 \leq x \leq 1$, and report the magnetic properties. Magnetic susceptibility χ(T) shows a broad maximum at $T_{max} = 73$ K and 83 K in Sr_2CuTeO_6 and Sr_2CuWO_6, respectively. T_{max} reaches a minimum of ≈50 K in the vicinity of $x \approx 0.5$ coinciding with a maximum in χ_{max}. This suggests the realization of the highly frustrated J_1-J_2 antiferromagnet near $x \approx 0.5$. [1] H. Walker et al., Phys. Rev. B 94 64411. [2] P. Babkevich et al., arXiv:1605.09714.

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