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Order and disorder in a new potential quantum spin liquid

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The idea of quantum spin liquid (QSL) on the triangular lattice was proposed by P. Anderson in 1973. Since his work, a lot of theoretical and experimental efforts have been made to explore deeper this state. Here we present the results for the combined study of structural and dynamic properties in application to the polycrystalline $CuSb_2O_6$ sample. The diffraction experiments using both synchrotron x-ray (ESRF) and neutron (ILL) scattering techniques showed the main motive of metastable rosiaite-type phase with the presence of microstructural defects. This system likely hosts the QSL state since the magnetic cations Cu^{2+} with S = ½ were found to be trigonally arranged within the distinguished magnetic layers and no long-range order is observed down to 46 mK. Indeed, the antiferromagnetic spin-spin correlations tend to appear below ~50K in a presence of a strong geometrical frustration without any sign of spin freezing. Low-temperature inelastic neutron scattering showed gapless dispersive-like magnetic excitations, which are believed to be associated with the fractionalized quasiparticles, spinons, that are expected for the QSL state. Reverse Monte Carlo simulations conclude the fully frustrated, most probably 3D AFM interaction scheme. We examine the observed results as a potential quantum spin liquid behavior in $CuSb_2O_6$.

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