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Towards Fluctuating Magnetism in Zn-Doped Averievite with Well-Separated Kagome Layers

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The mineral averievite Cu5V2O10(CsCl) possesses a different structure compared to herbertsmithite and other Cu-based kagome spin liquid candidates. The kagome layers are separated by two spacer layers, instead of one in herbertsmithite, reinforcing the 2D character.

The pristine averievite is known to order magnetically at 24 K due to Cu2+ magnetic interlayers but these can be replaced selectively by non-magnetic Zn2+, thus magnetically decoupling the kagome layers [1]. This gives access to an idealized kagome system as well as a tuning parameter to control the three-dimensionality. While only x<1.25 compounds have been reported in the literature, we were able to produce samples with x=2 [2].

We present a MuSR study for x ranging from 0 to 2 [3]. While we confirm the long-range magnetic order in the parent compound (x=0) below 24 K, we clearly show that only a full substitution of inter-plane copper ions (x=2) leads to a quantum-disordered ground state. The experiments performed on the partially substituted material (x=1) uncover that the transformation proceeds through an intermediate frozen disordered ground state. The end compound x=2 thus opens a new avenue to study kagome quantum spin liquids and we will discuss our findings with respect to other existing Cu-based kagome systems.

[1] A.S. Botana et al, PRB 58, 054421 (2018)
[2] M. Georgopoulou et al., arXiv2306.14739 (2023)
[3] G. Simutis et al., arXiv:2504.20871 (2025)

Email

gediminas.simutis@psi.ch

Funding Agency

Supervisors Name

Supervisors Email

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Primary author: SIMUTIS, Gediminas (Paul Scherrer Institute)

Co-authors: SUÁREZ-GARCÍA, Lara; ZEROUAL, Hafsa; VILLA, Ilaria; GEORGOPOULOU, Madeleine; SHIROKA, Toni (Paul Scherrer Institut & ETH Zurich, Switzerland); WANG, Chennan; KHASANOV, Rustem (Paul Scherrer Institute); LUETKENS, Hubertus (Paul Scherrer Institute); SASSA, Yasmine; BOLDRIN, David; WILLS, Andrew; Prof. KERMARREC, Edwin; Prof. BERT, Fabrice; Prof. MENDELS, Philippe

Presenter: SIMUTIS, Gediminas (Paul Scherrer Institute)

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