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Intriguing Topological Kagome Magnetism of $TbMn_6Sn_6$

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Magnetic topological phases of quantum matter are an emerging frontier in physics and material science [1-6], of which kagome magnets appear as a highly promising platform. Here, we explore magnetic correlations in the recently identified topological kagome system $TbMn_6Sn_6$ using μSR, combined with local field analysis and neutron diffraction [1,4]. Our studies identify an out-of-plane ferrimagnetic structure with slow magnetic fluctuations which exhibit a critical slowing down below $T^*_{C1} \simeq 120$ K and finally freeze into static patches with ideal out-of-plane order below $T_{C1} \simeq 20$ K. The appearance of the static patches sets in at a similar temperature as the appearance of topological transport behaviors. We further show that a hydrostatic pressure of 2.1 GPa stabilizes the static out-of-plane topological ferrimagnetic ground state in the whole volume of the sample. Therefore the exciting perspective arises of a magnetically-induced topological system whose magnetism can be controlled through external control parameters. The present results [4] will stimulate theoretical investigations to obtain a microscopic understanding of the relation between the low-temperature volume-wise magnetic evolution of the static c-axis ferrimagnetic patches and the topological electronic properties in $TbMn_6Sn_6$.

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