

Supporting Information for

Magnetic Clusters and Ferromagnetic Spin Glass in the Novel Hexagonal Perovskite $12R\text{-Ba}_4\text{SbMn}_3\text{O}_{12}$

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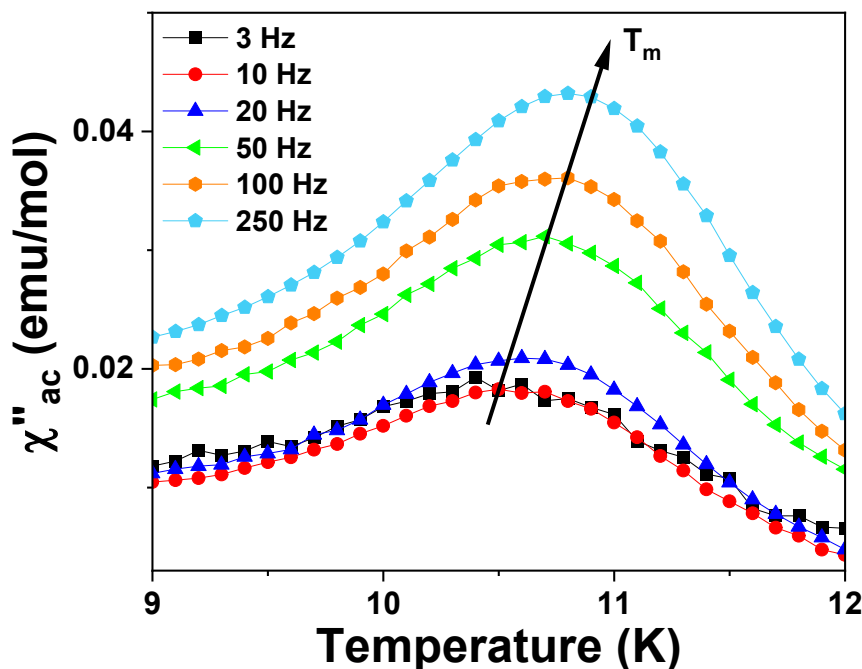


Fig. S1 Temperature dependence of the imaginary *ac* susceptibility component χ'' at frequencies of $3 \leq f \leq 250$ Hz.

Table S1. Structural information and ground magnetic state of 12R Ba₄MMnO₁₂ perovskite

Compounds (Ref.)	Space group	<i>a</i> (Å)	<i>c</i> (Å)	<i>V</i> (Å ³)	Ground state
Ba ₄ NbMn ₃ O ₁₂ ^[1]	<i>R</i> $\bar{3}m$	5.71825(3)	28.1158(3)	796.15	FM; T _C =42 K
Ba ₄ Sn _{1.1} Mn _{2.9} O ₁₂ ^[2]	<i>R</i> $\bar{3}m$	5.72904(3)	28.1637(3)	800.54(1)	AFM, T _N =6 K
Ba ₄ CeMn ₃ O ₁₂ ^[3]	<i>R</i> $\bar{3}m$	5.7980(1)	28.6070(8)	832.83(4)	AFM, T _N = 6 K
Ba ₄ YMn ₃ O _{11.5} ^[4]	<i>R</i> $\bar{3}m$	5.78752(3)	28.6213(3)	830.24(2)	AFM, T _N =4 K
Ba ₄ Ti ₂ Mn ₂ O ₁₂ ^[5]	<i>R</i> $\bar{3}m$	5.6913(1)	27.9186(2)	783.168(4)	AFM, T _N =45 K
Ba ₄ PrMn ₃ O ₁₂ ^[6]	<i>R</i> $\bar{3}m$	5.7943(1)	28.5716(3)	830.76(1)	
Ba ₄ InMn ₃ O _{11.5} ^[7]	<i>R</i> $\bar{3}m$	5.7382(2)	28.240	805.28	
Ba ₄ SbMn ₃ O ₁₂	<i>R</i> $\bar{3}m$	5.72733(3)	28.1770(3)	804.073(2)	FM, T _C =11.5K

References

- 1 L. T. Nguyen, T. Kong and R. J. Cava, *Mater. Res. Express*, 2019, **6**, 056108.
- 2 J. Wu, X. Yan, W. Guo, X. Wang, C. Yin and X. Kuang, *RSC Adv.*, 2021, **11**, 40235-40242.
- 3 M. A. Macías, O. Mentré, C. Pirovano, P. Roussel, S. Colis and G. H. Gauthier, *New J. Chem.*, 2015, **39**, 829-835.
- 4 X. J. Kuang, C. Bridges, M. Allix, J. B. Claridge, H. Hughes and M. J. Rosseinsky, *Chem. Mater.*, 2006, **18**, 5130-5136.
- 5 G. M. Keith, C. A. Kirk, K. Sarma, N. M. Alford, E. J. Cussen, M. J. Rosseinsky and D. C. Sinclair, *Chem. Mater.*, 2004, **16**, 2007-2015.
- 6 A. F. Fuentes, K. Boulahya and U. Amador, *J. Solid State Chem.*, 2004, **177**, 714-720.
- 7 N. Créon, C. Michel, M. Hervieu, A. Maignan and B. Raveau, *Solid State Sci.*, 2003, **5**, 243-248.