

# Supplementary information

**Unusual ferromagnetic critical behavior owing to short-range antiferromagnetic correlations  
in antiperovskite  $\text{Cu}_{1-x}\text{NMn}_{3+x}$  ( $0.1 \leq x \leq 0.4$ )**

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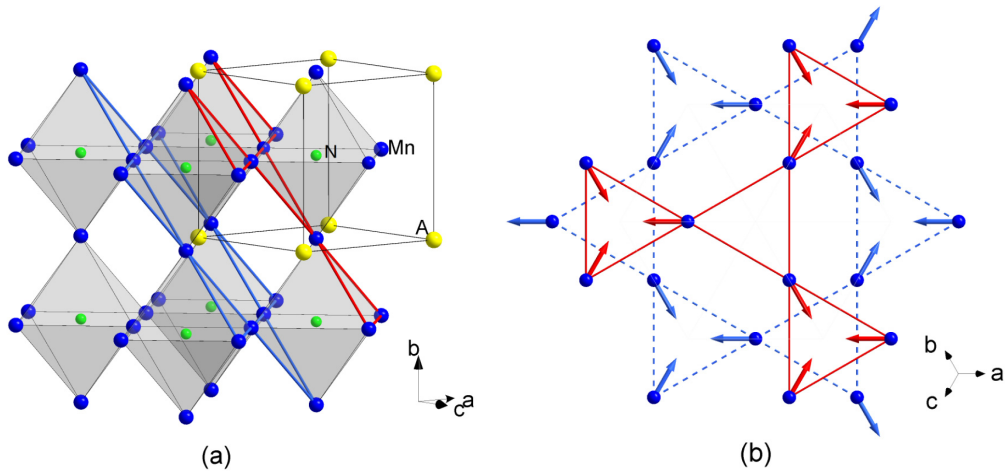
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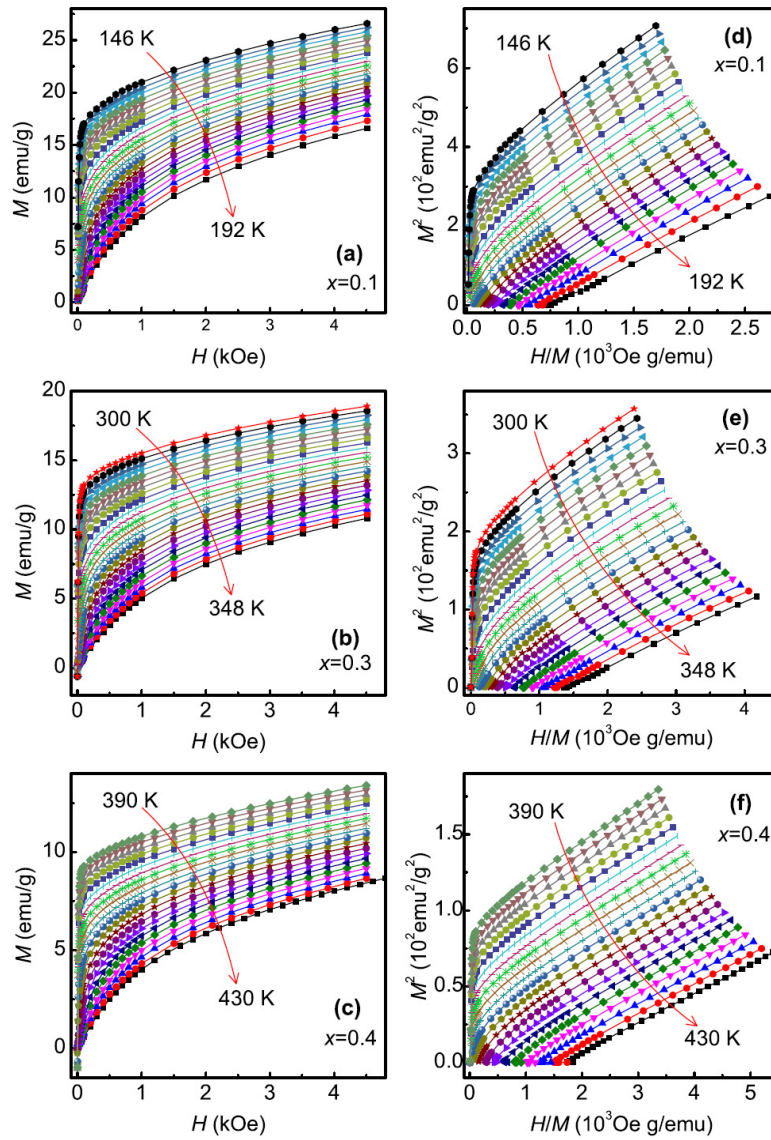
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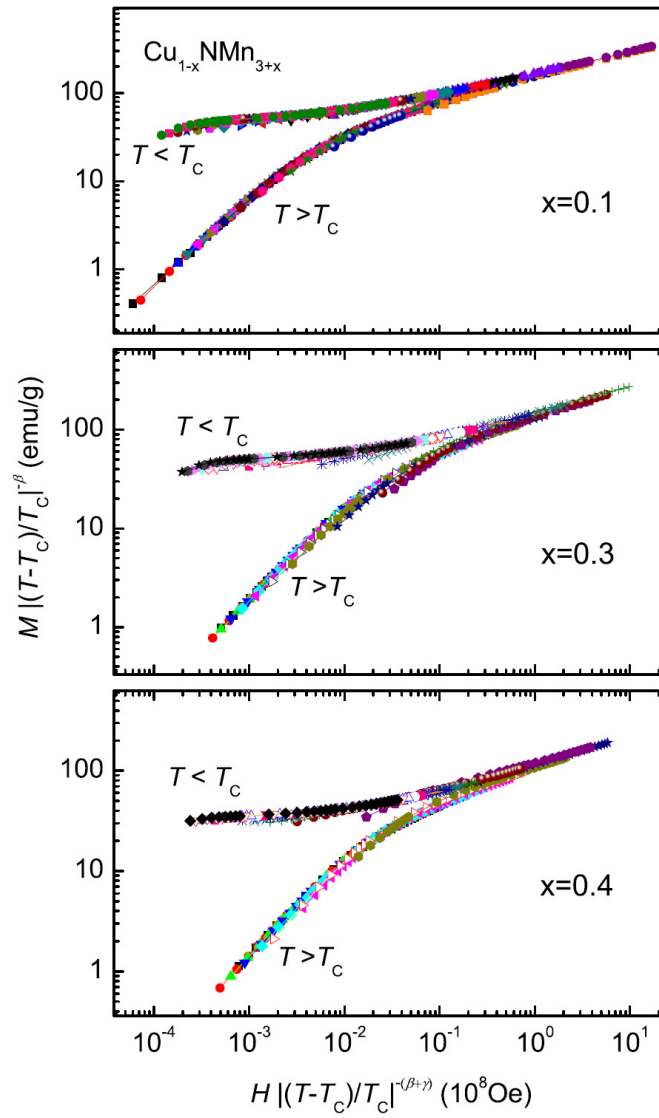
## Supplementary Figures S1-S4



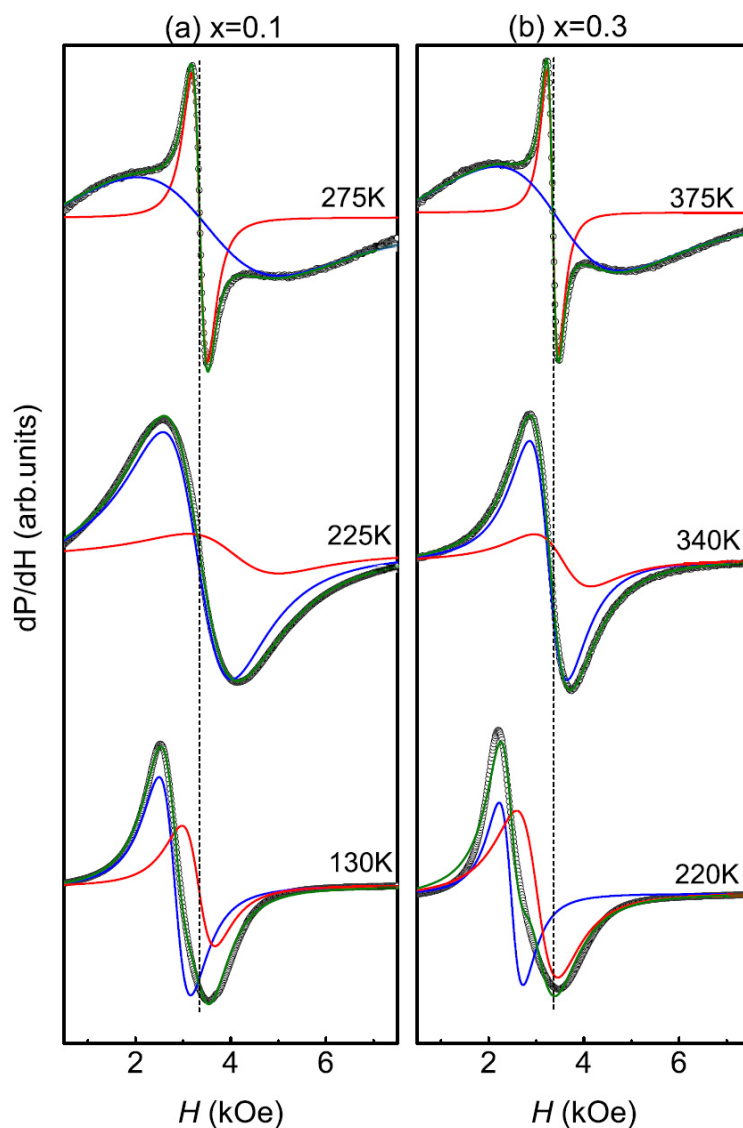
**Figure S1.** (a) The crystal structure for the Antiperovskite manganese nitrides ANMn<sub>3</sub> (A, main group or some *3d*, *4d* elements). Here the three dimensional corner-sharing Mn<sub>6</sub>N octahedra are highlighted. The bonds in blue and red represent for the two adjacent (111) planes. (b) The  $\Gamma^{4g}$  type antiferromagnetic configuration (viewing from [111] direction) often observed in the antiperovskite manganese nitrides is shown for two neighboring (111) planes (only Mn atoms are shown). For more information about the magnetic structures of ANMn<sub>3</sub> compounds, please refer to the references 47 and 48 in the main text of the manuscript.



**Figure S2.** The initial isothermal magnetization measured around  $T_C$  for  $\text{Cu}_{1-x}\text{NMn}_{3+x}$  with  $x=0.1$  (a), 0.3(b) and 0.4 (c). The temperature step is 2K. Arrott plots ( $M^2$  vs  $H/M$ ) transformed from the  $M(H)$  data are shown in (d), (e) and (f) for  $x=0.1$ , 0.3 and 0.4, respectively.



**Figure S3.** The scaling plots of  $M(H)$  for  $\text{Cu}_{1-x}\text{NMn}_{3+x}$  ( $x=0.1, 0.3$  and  $0.4$ ) with the  $\beta$  and  $\gamma$  values obtained from Figure 2(b).



**Figure S4.** The ESR spectra at some typical temperatures for  $\text{Cu}_{1-x}\text{NMn}_{3+x}$  with  $x=0.1$  (a) and 0.3 (b). The scattered points are the experimental data, while the solid line superimposed on it denotes the fit curve. Other solid lines represent the decomposed spectra. The vertical dotted lines indicate the paramagnetic resonant field ( $\sim 3350$  Oe).