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Giant orthorhombic distortions by Cu^{2+} in ferrimagnetic spinel Mn_3O_4[1] JAE-HO CHUNG, KEE HWAN LEE, HUN CHANG, IN YONG HWANG, Korea University, HYUN WOOK KANG, SU JAE KIM, SEONGSU LEE, Korea Atomic Energy Research Institute — Mn_3O_4 is a tetragonal ($c > a$) spinel that exhibits noncollinear Yafet-Kittel ferrimagnetic ordering at low temperatures. We report large orthorhombic distortions in its ferrimagnetic phase stabilized by a few percent of Cu doping. The orthorhombic strains of the ferrimagnetic phases increased linearly to the doping and reached up to $\epsilon \approx 8.2 \times 10^{-3}$ for $x = 0.19$, which is three times larger than the saturated value under external magnetic fields. For high doping ($x \gtrsim 0.17$), the distortions first appeared in the paramagnetic phases and underwent further enhancement simultaneously with the onset of the noncollinear ferrimagnetic ordering. We present the rich magnetostructural phase diagram of $Cu_xMn_{3-x}O_4$, and argue that the diluted t_2 orbital degeneracy of Cu^{2+} under tetrahedral crystal field breaks the global symmetry and triggers the orthorhombic instability inherent in Mn_3O_4.

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