Massive magnetostriction of the $KEr(MoO_4)_2$

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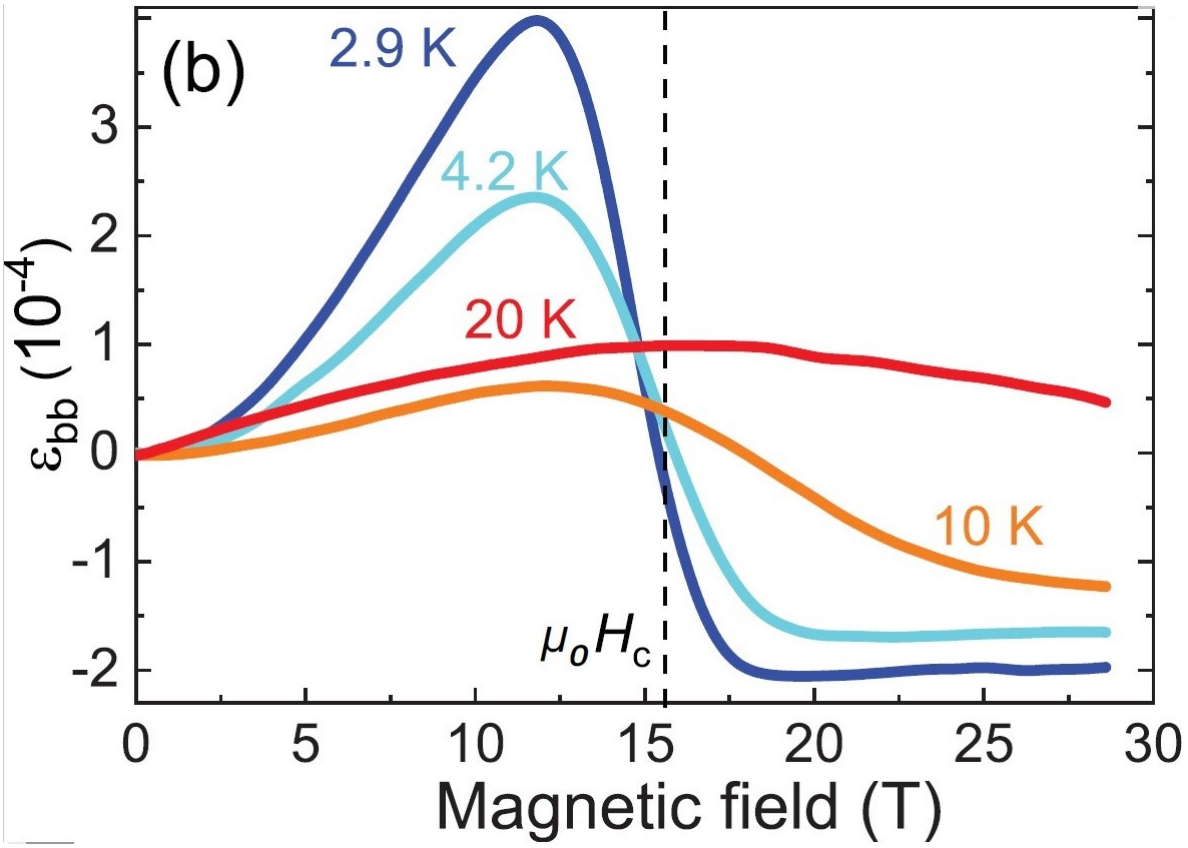
The investigation of magnetostrictive properties of ferro- and antiferromagnets helps the fundamental understanding of magnetism and superconductivity and plays an important role in realising technological applications. In paramagnets, however, the magnetostriction is usually signicantly smaller, because of the magnetic disorder. Here, we report the observation of a remarkably strong magnetostrictive response ($\varepsilon = \Delta l/l > 10^{-4}$) of the paramagnetic compound $KEr(MoO_4)_2$ at 15.6 T.



Using low-temperature dilatometry, magnetisation, and THz spectroscopy measurements in magnetic fields up to 30T, in combination with *ab-initio* calculations, we demonstrate that the magnetostriction anomaly is driven by a single-ion effect. Our analysis reveals a strong coupling between the Er^{3+} ions and the crystal lattice, due to the peculiar behaviour of the quadrupolar moments of Er^{3+} ions in the applied field, shedding light on the microscopic mechanism behind the massive lattice response.