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【118】 Giant Magnetoelectric Response and Cross-Caloric Effect Around a Tetracritical Point in Multiferroic SrMnO_3

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SrMnO_3 can be strain-engineered to be multiferroic, with coexisting and tuneable magnetic and ferroelectric (FE) order. We recently showed, using *first principles* calculations, that the ferroic strain-temperature phase diagram of SrMnO_3 accommodates a tetracritical point (TCP) with coinciding magnetic and FE ordering temperatures.

Here, we construct a Landau theory with parameters determined from *first principles* DFT and effective Hamiltonian calculations, and demonstrate large magnetoelectric coupling, several orders of magnitude larger than in conventional magnetoelectrics, occurring near the TCP. We study a giant magnetic cross-caloric effect, increasing the electrocaloric effect by 60%, providing an example of a large, useful magnetoelectric coupling effect in an antiferromagnetic multiferroic. This opens new possibilities for promising research directions among caloric effects for solid state cooling.

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