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**Thermodynamics of Multicaloric Effects in Multiferroics** ANTONI PLANES, TERESA CASTAN, University of Barcelona, AVADH SAXENA, Los Alamos National Lab — Ferroic and multiferoic materials thermally respond to externally driven changes of ferroic properties. Usually these changes are induced by application or removal of the field thermodynamically conjugated to a specific property. The isothermal change of entropy and the adiabatic change of temperature are commonly used in order to quantify the caloric response of a given material. From this perspective we provide a general thermodynamic framework to study multicaloric effects in multiferroic materials. This is applied to the case of a magnetoelectric multiferroic, which is described by means of a Landau free energy with a biquadratic coupling between polarization and magnetization. We obtain a phase diagram, the isothermal entropy change and the adiabatic temperature change across different continuous and first order transitions as the applied electric and magnetic fields are varied. The obtained multicaloric effects are suitably decomposed into the corresponding electrocaloric and magnetocaloric contributions.

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