Hysteresis in magnetocalorics

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Hysteresis in any generalized displacement variable (such as magnetization) as a function of the conjugated field (such as magnetic field) is a source of dissipation. In the particular case of magnetocalorics, adiabatic temperature changes relying on the presence of first order magnetostructural transitions are subjected to the adversities of the related transitional hysteresis. To be able to design suitable magnetocaloric materials, it is necessary either to overcome hysteresis totaly or to 'live with' hysterses that are sufficiently narrow. We present here, first, the various steps occurring in the adiabatic temperature-change process when a magnetic field is applied and removed cyclicly at first order magnetostructural transitions. Then we examine the cause of hysteresis, particularly in relation to the nature of magnetic coupling around the magnetostructural transition. The experimental thermodynamic and spectroscopic invstigations are undertaken in martensitic Heuslers, antiperovskite manganites, and manganese-based pnictides.

Key Words: Magnetocaloric, Heusler, Antiperovskite, Pnictide

Invited