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Giant Electrocaloric Effect in Ferroelectric Polymers with Great Impact on Energy and Environment XINYU LI, XIAOSHI QIAN, HAIMING GU, SHENGGUO LU, QIMING ZHANG, Eletrical Engineering Department and Materials Research Institute, The Pennsylvania State University — Refrigeration and air conditioning overall consume around 20% of the energy budget in developed countries which necessitates a search for new approaches to increase the energy efficiency of these cooling technologies. Cooling technologies based on the electrocaloric effect (ECE) hold great potential and promise in realizing these goals. The electrocaloric effect (ECE) refers to the change in temperature and/or entropy of a dielectric material by an applied voltage. Recently, a class of P(VDF-TrFE) based ferroelectric polymers have been discovered that provide a giant electrocaloric effect with an adiabatic temperature change of $\Delta T \sim 20$ K and an isothermal entropy change $\Delta S > 90$ J/kgK at room temperature. This talk will review the earlier works in the ECE, as well as present the basic materials considerations and experimental results of the ECE in both normal and relaxor ferroelectric polymers. It will be shown he relaxor ferroelectric polymer displays a nearly flat ECE response over a broad temperature range, which is very attractive for practical cooling device applications Furthermore, we will present our recent investigation, exploiting the giant ECE in these polymers for cooling devices with compact size, high cooling power and efficiency.

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