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Shape-Memory Polymers Based on Fatty Acid-Filled Elastomeric Ionomers ELISE IZZO, ROBERT WEISS, University of Connecticut — Shape memory polymers (SMPs) have applications as medical devices, actuators, sensors, artificial muscles, switches, smart textiles, and self-deployable structures. All previous design of SMPs has involved synthesizing new polymers or modifying existing polymers. This paper describes a new type of SMP based on blends of an elastomeric ionomer and low molar mass fatty acids or their salts (FAS). Shape memory elastomers were prepared from mixtures of a sulfonated EPDM ionomer and various amounts of a FAS (e.g., zinc stearate, zinc oleate, and various aliphalic acids). Nanophase separation of the metal sulfonate groups provided the "permanent" crosslinks, while sub-microscopic crystals of the low molecular weight FAS provided a physical crosslink needed for the temporary shape. The material was deformed above the melting point of the FAS and the new shape was fixed by cooling the material while under stress to below the melting point of the FAS. Polar interactions between the ionomer and the FAS stabilized the dispersion of the FAS in the polymer and provided the continuity between the phases that allowed the crystals of the FAS to provide a second network of physical crosslinks. The temporary shape was erased and the material returned to the primary shape by heating above the melting point of the FAS.

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