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Resistive switching in bulk polymer nanocomposites containing silver nanowires KAREN WINEY, University of Pennsylvania, SADIE WHITE, PATRICK VORA, JAY KIKKAWA, ROSE MUTISO, University of Pennsylvania — Traditionally, bulk nanocomposites of electrically conducting particles and insulating polymers have been categorized as either insulating or conducting when the nanoparticle concentration is below or above the percolation threshold, respectively. We present the first examples of reversible resistive switching in bulk, glassy polymer nanocomposites. At compositions close to the electrical percolation threshold, silver nanowire-polystyrene nanocomposites demonstrate reversible resistive switching upon increase voltage at room temperature. Nanocomposites with compositions outside of this range exhibit either irreversible switching, or no switching at all. We propose that resistive switching in these materials is the result of the field-induced formation of silver filaments that bridge adjacent nanowire clusters, extending the percolation network and decreasing the sample's bulk resistivity. We also describe the temperature-dependent characterization of resistive switching in these nanocomposites between 10 and 300K. These findings break from the usual dichotomy of insulating or conducting properties in polymer nanocomposites and could inspire new devices that capitalize on this responsive behavior in these versatile materials.

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