

Highly deformable ionic polymer actuator under ambient condition

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In this research, sulfonated graphene oxide (sGO) with a large enhanced sulfonation degree of 1.65 mmol g⁻¹ was simultaneously introduced as a highly ion conducting filler for ionic polymer actuator. High-performance, air-operable ionic polymer actuators based on the nanostructured sulfonated styrenic block copolymer (SSPB)/sGO/ionic liquid (IL) polyelectrolyte membrane revealed much larger actuation performance without drawbacks of conventional IPMCs, such as back-relaxation and early loss of inner solvent. The enhanced performance is intimately related to the well-defined microphase-separated ionic domains on the scale of several tens of nanometers in the nanostructured SSPB polyelectrolyte and the strong interactions between the mobile IL's ions and the sulfonic groups on the sGO inside the SSPB, which lead to a fast and efficient transport of bulky IL's ions.