

Abstract Submitted
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Superfast Ionic Polymer Actuators Based on Single-Ion Conducting Block Copolymers ONNURI KIM, MOON JEONG PARK, Pohang Univ of Sci Tech — Ionic polymer actuators have attracted enormous attention for a variety of biomimetic applications owing to many beneficial characteristics of low-driving voltages, softness, and lightness. Although ionic polymer actuators have demonstrated large bending strains analogous to human muscles, major drawbacks are the slow response time and back-relaxation. In the present study, we have investigated a new actuator based on cation-conducting block copolymers that show a superfast response time of several tens of milliseconds. Key ingredients are imidazole-doped self-assembled sulfonated block copolymers containing zwitterions. The introduction of zwitterions into nanoscale ionic PSS phases of block copolymers has offered remarkably increased dielectric constant, and accordingly increased the charge density and ionic conductivity while the single-ion conducting nature was preserved. The actuators containing zwitterions were able to move a few millimeters within tens of milliseconds under 1V-operation and no back relaxation was detected, which marked a significant progress as compared to the conventional ionic polymer actuators. It has been further revealed that type of zwitterions play an important role in determining the electromechanical properties of the actuators.

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