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Anisotropy of Electroactive Strain in Textured Polypyrrole Actuators RACHEL PYTEL, EDWIN THOMAS, IAN HUNTER, Massachusetts Institute of Technology — Polypyrrole has been extensively studied as an electroactive material, but these studies have provided little insight to the influence that morphology has on actuation at the nanoscale. By discovering and exploiting the connection between nanoscale transport events and macroscale active strain, we can learn how to process polypyrrole and other conducting polymers for improved electroactive device performance. We show that by controlling polymer chain configuration and packing, a conducting polymer actuator can be engineered that shows a significantly larger macroscopic electroactive response for a given set of driving conditions. We utilize different modes of deformation to impart orientation textures that can be observed via synchrotron x-ray diffraction and electronic and ionic resistance measurements. Certain textures enhance pathways for ion transport between polymer chains, resulting in an anisotropic electroactive strain response that can be harnessed when making polypyrrole-driven devices. This response provides valuable insight to the mechanism of polypyrrole actuation on the nanoscale, supporting a mechanism where counterions migrate to locations between the oriented polymer chains.

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