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Manipulating meso-structure and electrical conductivity in polymer-acid doped polyaniline by exploiting redox chemistry JACOB TARVER, JOLINE FAN, YUEH-LIN LOO, Department of Chemical & Biological Engineering, Princeton University — Template synthesis of polyaniline on poly(2-acrylamido-2-methyl-1-propane sulfonic acid) yields electrostatically stabilized particles that can be aqueously dispersed and cast into thin films; electrical conductivity in these films scales with inter-particle connectivity. Solvent annealing with dichloroacetic acid induces structural relaxation of the polymer acid, thereby eliminating the particulate nature of thin films and consequently increasing their conductivity by up to two orders of magnitude (from 0.4 to 40 S/cm). Alternatively, the electrostatic interactions between polyaniline and its template can be neutralized through chemical reduction with hydrazine monohydrate, after which the polymer acid can be plasticized by water vapor to encourage structural relaxation. Exposure to nitric oxide leads to oxidation of polyaniline and concurrent reassociation with its polymer acid dopant. Enhanced conductivity is observed following this redox process, and is attributed to extensive polymer chain relaxation and the simultaneous elimination of the particulate nature of template-synthesized polyaniline.

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