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Quantifying the rapid dynamics of polyelectrochromic switching in polymer acid-doped polyaniline JACOB TARVER, YUEH-LIN LOO, Department of Chemical and Biological Engineering, Princeton University — Films cast from particles comprising polyaniline template synthesized on poly(2-acrylamido-2-methyl-1-propanesulfonic acid) exhibit polyelectrochromism and possess superior switching times (<10 s) and enhanced stability relative to other polymer acid-doped polyaniline systems. Solvent annealing in dichloroacetic acid induces polymer chain relaxation and further improves the speed (~ 1 s) and stability of electrochromic cycling. Electrochromic responses before and after solvent annealing can be described by Avrami kinetics that capture the influence of the film's mesoscale structural development and reveal variations in the dimensionality of reaction fronts when switching between the insulating and conducting states. Transitions from the conductive state are best fit by an Avrami exponent of 1.5 and are consistent with a reaction homogeneously initiated throughout the film. Transitions to the conductive state require fits with exponents ≥ 2 , suggesting nucleation and auto-accelerated propagation of conductive pathways away from the film/electrode interface in a manner analogous to polymer crystallization.

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