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Controlling the swelling and wettability of weak polyelectrolyte brushes RICHARD GURTOWSKI, BENXIN JING, ELAINE ZHU, University of Notre Dame — Weak polyelectrolytes (PE) of tunable ionization shows great potential as "smart" polymer materials for diverse applications from drug delivery to energy storage. However, the conformational dynamics of surfaced-tethered weak PE chains remain inadequately understood due to the complexity of their dynamic charge states in response to solvation and surface immobilization conditions. In this work, we investigate the wetting and swelling characteristics of poly(2-vinyl pyridine) (P2VP) brushes grafted to a gold substrate by AFM and water contact angle measurements. We observe the collapse of P2VP brushes, accompanied with increased surface hydrophobicity, as increasing solution pH across a critical transition pH, which is considerably lower than the pKa of free P2VP chains in bulk solution. Surprisingly, the broadness of the transition pH range shows a strong dependence with brush thickness, but not grafting density, suggesting a distribution of chain ionization along grafted P2VP brushes. We further manipulate P2VP brush structures by applying ac-electric fields across the brushes to make tunable and switchable polymer surfaces.

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