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Structure and Phase Behavior of End-Tethered Weak Polyelectrolytes IGAL SZLEIFER, PENG GONG, Purdue University — The behavior of weak polyelectrolytes tethered at one of their ends to a surface and/or interface is studied using a molecular theory that explicitly accounts for the inhomogeneous acid-base equilibrium of the polymer segments. The predictions for the thickness of polyacrylic acid as a function of salt concentration are in excellent quantitative agreement with the experimental observations from the Genzer group. The local degree of dissociation of the polymer segments varies with bulk salt concentration and the local pH can change by two units in the interior of the polymer layer. In general, water is a relatively poor solvent for the polymer segments, which are soluble due to the presence of the charged groups. Therefore, one expects phase separation as the quality of the solvent decreases, depending on the degree of charging of the polymer. We will show how the phase diagrams of mobile weak polyelectrolytes tethered layers depend upon the salt concentration and bulk pH, together with the structure of the polymer layers along the coexistence curves. The two coexisting phases show very different degree of charge and as a result different structural properties. The possibility of microphase separation in the case of polymers end-grafted to the surface will be discussed. The implications of the results for practical application of weak polyelectrolyte layers will be presented.

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