Electro-responsive polymer surfaces

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Polymers are good candidates to build smart materials (materials that can change their properties in response to a changing environment), as their properties can often be tuned by variation of different variables. Thus, changing the conformation of polymers by external stimuli makes it possible to control the properties of polymer-based materials [1-3]. However, The efficient and reversible control of these properties represents an important technological challenge. In this regard, the application of an external electrical stimuli on polyelectrolytes [4] seem to be a convenient control strategy, as the response of polymer chains to physical stimuli is usually faster than the adaptation to chemical stimuli. In this work we discuss the effect of an external electric field on the wettability and adhesion properties of polystyrene-block-polyacrylic acid (PS-b-PAA) copolymer surfaces. The influence of the externally applied electric field is investigated at different pH and salt conditions, as the polyelectrolyte conformation is sensitive to these variables. The figure shows the evolution of the advancing and receding contact angles on a PS-b-PAA surface at pH 4 as a function of the applied voltage. The relatively large variation in contact angle at very low applied voltages and the assymetric dependence of the response to the sign of the applied field can not be described by conventional electrowetting theories, evidencing the positive effect of the polyelectrolyte coating. We will discuss a model based on polyelectrolyte theories to describe the observed response.

![Graph showing contact angles vs. voltage](image)

**Figure 1:** Advancing and receding contact angle of water on polystyrene coated with PS-b-PAA vs. externally applied voltage at pH 4