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Polyelectrolyte brushes on dielectric surfaces HANNE ANTILA, ERIK LUIJTEN, Northwestern University — When chains of charged polymers are grafted to a solid surface, a polyelectrolyte (PE) brush results. These types of PE assemblies have a wide range of applications ranging from fuel cells and switchable electrodes to drug delivery. Many of these applications stem from the ability of PE brushes to respond to external stimuli: the brush properties can be tuned, for example, by varying electric field, PE grafting density, pH, salt concentration or salt valency. Accordingly, deciphering the brush behavior under different conditions has been a subject of considerable experimental, theoretical, and computational research efforts. However, the effect of the dielectric properties of the substrate on the PE brush has received much less attention. We use coarse-grained molecular dynamics simulations to show how varying the dielectric mismatch between the solvent and the substrate can significantly affect the brush. We demonstrate how tuning this mismatch can either diminish or enhance the effects of other control parameters, such as pH, on the brush properties. Furthermore, we investigate how dielectric properties of the substrate affect the brush, and the ion distribution and mobility within the brush, when the brush is exposed to an electric field.

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