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Thermal Properties of Linearly and Exponentially Growing Layer-by-Layer Assemblies AJAY VIDYASAGAR, JODIE LUTKENHAUS, Texas A&M University — Polyelectrolyte multilayer thin films have received significant attention for assembling various nanostructured coatings, but their thermochemical properties are challenging to measure. Here, we present results regarding the thermochemical properties of two different "model" layer-by-layer (LbL) assemblies. The LbL process involves alternate deposition of positively and negatively charged polymers resulting in interpenetrating networks of layers with fine structural control. Films may grow linearly or exponentially, and each type of growth is expected to give varied internal structure. Poly(allylamine hydrochloride)/poly(styrene sulfonate) (PAH/PSS) multilayers assembled without (or with) added salt are selected as the linear (or exponential) "models." Other systems explored include hydrogen bonding and PAH/poly(acrylic acid) multilayers. In general, linear growth takes place due to charge overcompensation leading to thinner films than exponential growth, where interdiffusion of polyelectrolytes is a major driving force forming much thicker films. Calorimetry and ellipsometry were used to determine glass transition and crosslinking temperatures. A standing hypothesis is that linear (or exponential) growth is observed for glassy (or rubbery) multilayers. The aim of this work is to understand the origin of linear versus exponential growth in polyelectrolytes with respect to their thermal properties.

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