72b Manipulating the Thermal Properties of Flexible, Elastomeric Hydrogen Bonded Nanoblends

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Polyethylene oxide(PEO) has long been a polymer of interest as a polymer electrolyte, biomaterial, drug delivery, and pH sensitive sensor. If used as an electrolyte, the semi-crystalline nature of PEO acts as a road block to impede the transport of ions through the matrix. Adding plasticizers breaks up crystallinity and enhances salt dissolution but also detracts from the mechanical properties, giving way to a gel-like material that can undergo deformation. Here, we introduce mechanical stability via hydrogen bonding with polyacrylic acid(PAA) in the layer-by-layer(LBL) assembly method. This method produces interdigitated layers of PEO and PAA that are mechanically robust and ionically conductive. To further enhance the ionic conductivity of the nano-scale blend, the glass transition is measured as a function of assembly pH via differential scanning calorimetry and dynamic mechanical analysis. The resulting trends give clues as to how the morphology and composition of a hydrogen bonded layer-by-layer film evolves as a function of pH. Of note, we can now isolate LBL films easily(Figure 1.) using low-energy surfaces to give areas as great as the assembly substrate, which lets us conduct thermal characterization studies that were previously out of reach. Our new method of multilayer isolation alloys for the characterization of electrostatically bound systems as well, such as linear polyethylene imine and polyacrylic acid.


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