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Manipulating Assembly, Disassembly and Exchange in Responsive Polyelectrolyte Multilayers[1]

PAULA HAMMOND, Massachusetts Institute of Technology

Polyelectrolyte multilayer assembly is based on the alternating adsorption of multilvalent positively and negatively charged species to create ionically crosslinked thin films with nanoscale control of film composition and function. We have utilized this method of assembly to manipulate ion transport, molecular transport, and electrochemical transport in these films, enabling the generation of a range of organic and organic-inorganic devices. Biological materials applications are also derived from such films, enabling their use as drug delivery devices. In each of these applications, it is desired to control interdiffusion and exchange within the multilayer systems to maintain desired function and generate isolated regions of composition and function within the z-direction of the film. Here we address these applications and means of controlling this phenomenon. Furthermore, it is desirable to induce controlled means of disassembly of these multilayer thin films. We will address a number of approaches for achieving this, including hydrolytic degradation, hydrogen bond dissociation, and controlled deconstruction on electrochemical impulse.

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