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**Polyelectrolyte Multilayer: pH-responsive lipid bilayers and beyond**

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Creating large-scale fluid lipid bilayer that are independent from a supporting substrate, stable and durable would be advantageous to multiple applications. A robust and simple method for the preparation of pH-responsive membranes is reported. Structural characterization using Neutron Reflectivity (NR), further supported by Fluorescent Microscopy and Electrochemical Impedance Spectroscopy measurements, revealed that the separation distance between a polymeric cushion and a lipid bilayer can be reversibly adjusted by varying the pH of the aqueous environment. We believe that this novel system offers great potential for fundamental biophysical studies of membrane properties decoupled from the underlying solid support. Additionally, creating large-scale fluid lipid bilayers would be advantageous to multiple applications. Such include membranes for biosensing arrays or cell culturing with easy detachment in one sheet. With regard to the last objective, various live cells have been investigated by NR under different environmental conditions. These measurements represent the first successful visualization and quantization of the interface between live cells and a substrate with sub-nanometer resolution, and are key in the understanding of physiology and disease.

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