Title	Liquid Crystal-Based Biosensors Using a Strong Polyelectrolyte-Containing Block Copolymer, Poly(4-cyanobiphenyl-4'-oxyundecylacrylate)-b-poly(sodium styrene sulfonate)
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Abstract

The interface between a nematic liquid crystal phase, 4-cyano-4′-pentylbiphenyl (5CB) and water was examined for protein detection by monitoring the formation of a complex between sodium polystyrene sulfonate (PSSNa) and a positively charged biological species on the 5CB in a transmission electron microscopy (TEM) grid cell coated with a strong anionic polyelectrolyte-containing block copolymer, LCP-b-PSSNa (LCP:poly(4-cyanobi phenyl-4′-oxyundecylacrylate)). This block copolymer was successfully synthesized by reversible addition-frag mentation chain transfer polymerization. A monolayer of LCP-b-PSSNa in a Langmuir Blodgett trough (in which PSSNa and LCP were located in and above water, respectively, in the TEM grid cell) was transferred to the 5CB/water interface in the 5CB-filled TEM grid that was already placed on octadecyltrichlorosilane-coated glass. Model proteins such as bovine serum albumin (BSA), hemoglobin (Hb), α chymotrypsinogen-A (ChTg), and lysozyme (LYZ) having different isoelectric points (pIs) were tested for non-specific protein detection. When the protein solutions were injected into the TEM grid cell, the initial homeotropic orientation of 5CB in the TEM grid cell changed to a planar one below the pIs of the proteins due to electrostatic interactions between PSSNa (- charge) and the pro teins (+ charge); this did not occur above the pIs of the tested proteins. The minimum concentrations at which the homeotropic to planar configurational changes (H-P changes) occurred were 0.02, 0.04, 0.04, and 0.08 wt% for BSA, Hb, ChTg, and LYZ, respectively. Therefore, the positively charged biomaterials were visually detected at the PSSNa-coated LC/water interface during an H-P change by using polarized optical microscopy under crossed polar izers. This simple set-up for non-specific biomaterial detection paves a way for the development of efficient and excellent quality biosensors.