Organization and structural properties of Langmuir films composed of conjugated polydiacetylene and phospholipids

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Abstract

Molecular assemblies containing phospholipids and conjugated polydiacetylene lipids exhibit unique bio-chromatic properties, and have attracted increasing interest in recent years as potential bio- and chemo-sensors. We present a detailed study of the properties of mixed films formed at the air-water interface, which consist of phospholipid molecules and diacetylene lipids. The organization of the films has been characterized by surface pressure-area isotherms. Application of atomic force microscopy, polarized optical microscopy, and uv-vis spectroscopy provides further insight into the structures and interactions of the film components. The data indicate that the two constituents in the film are miscible at low surface pressure, while segregation of phospholipid and polymer domains occurs at higher surface pressures. The distribution and interactions between the diacetylene and phospholipid domains additionally depends upon the molar fraction of phospholipid in the film. Characterization of the structural properties of the polydiacetylene domains in the films point to a formation of organized tri-layer and multi-layer phases at high surface pressures and high diacetylene concentrations.