Title:	Study of the Self-assembly of a Nonionic Surfactant at Aqueous-Liquid Crystal Interfaces
Authors:	Dutta, Sukanya
Keywords:	Nematic liquid crystals Environment-sensitive Polarised optical microscope
Issue Date:	28-Jul-2021
Publisher:	IISERM
Abstract:	Nematic liquid crystals (LCs) are anisotropic materials, whose long orientational order and high fluidity help to direct molecular assembly and amplify interfacial events into easily observable optical signals. Owing to the environment-sensitive fast response of LCs, they have been substantially studied to understand different complex biomolecular events at the interface. The self-assembly of surfactants, polymers, and other amphiphilic molecules at the nematic LC-aqueous interface, as well as the subsequent optical and orientational transitions in LC, have been extensively studied over the past few decades. In our project, we are trying to investigate various interfacial phenomena at aqueous-LC interfaces, using the polarised optical microscope (POM), that triggers orientational ordering transition of liquid crystal in the presence of the self-assembly of a nonionic surfactant tetra (ethylene glycol) mono-n-dodecanoate (Surf-LTE) and its cleaved fragments to understand the underlying mechanisms of such interactions. Keeping the goal of sustainable chemistry in mind, we are working with an eco-friendly bio-degradable nonionic surfactant system (Surf-LTE) that was synthesized in our lab. We have determined the critical micelle concentration (CMC) of Surf-LTE using the fluorescence probe method (DPH assay). Next, we have performed a set of polarized optical microscopy (POM) experiments and observed that Surf-LTE could spontaneously assemble at aqueous-LC interfaces to induce homeotropic orientations of the LC mesogens. The stability of such anchoring transition was also checked by varying the pH and salt concentration of the aqueous medium. In presence of a targeted stimulus (enzymes such as lipase) cleavage of the ester bond triggered a surface-driven ordering transition to a planar alignment of LC mesogens leading to a macroscopic bright optical signal. The optical response of precleaved moieties and cleaved fragments at the aqueous-LC interfaces was also found to be similar. The results of our study so far exhibit a straightforward and broad approach to the rational design of nonionic surfactant systems that can be used to program stimuli responsiveness into nematic LC-aqueous interfaces. The results provide an easy readout of interfacial events over time without the use of complex instruments and it is also label-free. The results of this study can have further applications in drug delivery thus enhancing its potential in the advancement of therapeutics.
URI:	http://hdl.handle.net/123456789/3919
Appears in Collections:	MS Dissertation by MP-2018

Files in This Item:

File	Description	Size	Format	
MP18025_MS_Thesis.pdf		3.96 MB	Adobe PDF	View/Open

Show full item record