Responsive nanostructured films: non-lamellar lipid liquid crystalline phases with embedded polymer microgels

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Nonlamellar lipid liquid crystalline (LC) phases are an adaptable class of materials that are increasingly being used for controlled-release in diverse fields including pharmaceutical, agricultural, and food technology. Here, we describe a hybrid structure that combines stimuli-responsive polymer particles with LC phase lipids to make a responsive surface coating. We demonstrate that spherical polymer microgels can be embedded within LC films to form responsive nanostructured surfaces. A simple spin-coating procedure was developed to form these hybrid films from the solubilized components followed by equilibration in excess water.[1] The mixed lipid layers, composed of glycerol monooleate and diglycerol monooleate lipids with poly(Nisopropylacrylamide)(PNIPAM) microgels with a diameter of about 55 nm, form hybrid films with reverse bicontinuous cubic phase structure that are capable of responding to temperature stimulus (Fig. 1). These new nano-materials, comprised of lipid-polymer-based responsive layers, open up for new sensor applications where temperature triggered control of layer hydration is required.

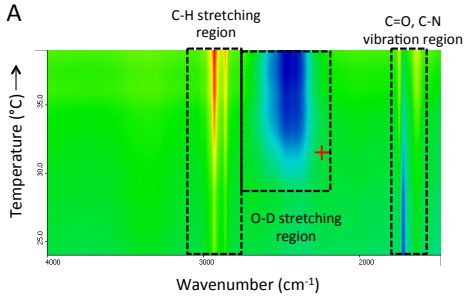

Figure 1. ATR-FTIR spectra of LC lipid-microgel film as a function of temperature, with red and blue signifying high and low absorbance, respectively. The O-D region shows expulsion of water (D_2O) from the layer with increasing temperature.

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[1] M. Wadsäter, J. Barauskas, T. Nylander and F. Tiberg, *Soft Matter*, 2013, **8**, 8815.