

Active microrheology of phospholipid monolayers at the air/water interface

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Although viscoelastic properties of surface active agents at fluid/fluid interfaces (e.g. block copolymers, surfactants, colloids, etc) may play a key role in stability, dynamics and function, the relatively weak rheological properties of such interfaces have rendered their study difficult or sometimes impossible. Accordingly, we have developed a novel technique to sensitively measure 2D surfactant layers at fluid/fluid interfaces. Using this technique, we measure the viscoelastic properties of the phospholipid DPPC monolayer at the air/water interface. Notably, our technique has a capability of direct visualization during measurements, which enables measured properties to be correlated with structural deformation. We reveal that a few nanometer scale monolayer has a far richer dynamics than has been previously reported, showing viscoelasticity, history-dependence, aging, yielding and a surprisingly long relaxation time.