Interaction between mixed monolayers of PMMA (contact lenses) and DPPC (ocular tears)

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Mixed monolayers of poly(methyl methacrylate) (PMMA)¹, the main component of the hard contact lenses, and dipalmitoyl phosphatidyl choline (DPPC), a characteristic phospholipidic constituent of the ocular tear film, were selected as an in vitro model in order to observe the behavior of the contact lenses on the eye. Using the Langmuir monolayer and Brewster angle microscopy (BAM)² techniques, the interaction between both components was analyzed from the data of surface pressure-area isotherms, compressional modulus-surface pressure and film thickness vs time curves, together with BAM images. Regardless of the surface pressure at which the molecular/monomer areas (Aₑ) were recorded, the Aₑ – mole fractions of PMMA (XPMMA) plots show that the experimental results match up with the theoretical values calculated from the additivity rule: Aₑ = XPMMA APMMA + XDPPC ADPPC. The application of the Crisp phase rule to the phase diagram of the PMMA-DPPC system can explain the existence of a mixed monolayer made of miscible components with ideal behavior. However, at very high surface pressures, when collapse is reached (at 60 mN/m), the single collapsed components are segregated into two independent phases.

Spread of tear lipids (dppc) raising the eyelids. PMMA contact lenses.
