Non-ionic triblock copolymers at the oil-water interface: structure and properties

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The structure and the dilational properties of three non-ionic trilock PEO-PPO-PEO copolymers (Pluronics F68, P9400 and L64) of increasing/decreasing hydrophobicity were investigated for the first time at the water-hexane interface. Surface dilational rheology has been investigated by means of the oscillating drop method at the water-hexane interface. Whereas, nulling ellipsometric measurements were carried out to gain insight into the copolymer structure.

From the dilational rheology measurements the limiting elasticity values, $E_0$, of the Pluronics as function of surface pressure $\Pi$ were obtained. In a dilute regime ($\Pi < 10 \text{ mN/m}$) $E_0$ was only a function of the surface pressure. At relatively high values of $\Pi$, interfacial transitions could occur and $E_0$ decreases passing through a local minimum. The main difference between the three copolymers studied can be quantified by the local minimum of $E_0$. It is observed that the minimum is more pronounced for more hydrophilic copolymers, i.e. Pluronics containing more oxyethylene (EO) groups, (F68 > P9400 > L64).

Changes of the ellipsometric parameters could reveal conformational transitions at the interface. Experimental results were discussed and explained on the basis of two- and three-dimensional structure where the copolymer hydrophilic content plays a crucial role.

![Limiting elasticity, $E_0$, vs. surface pressure, $\Pi$, plot. The symbols are the measurements obtained for the three Pluronics studied. The solid line is the slope of the lineal variation of the data at low surface pressure. Triangles: Pluronic F68, Squares: Pluronic P9400, Circles: Pluronic L64.](image-url)