Soluble complex salts formed by an ethoxylated polyelectrolyte and an oppositely charged surfactant

Ana Maria Percebom,1,* and Watson Loh1

1 Institute of Chemistry - University of Campinas - UNICAMP, P.O. Box 6154, 13083-970 Campinas - SP, Brazil
*e-mail: apercebom@iqm.unicamp.br

The interaction between oppositely charged polymers and surfactants molecules is often used to control their phase behavior of the mixture due to the strong tendency to phase-separate into one concentrated and one diluted phase. This communication reports studies of complex salts formed by a grafted polyelectrolyte, poly(methacrylate-co-ethoxylated methacrylate), P(MA-MAEO5), with different proportion of co-monomers. Copolymers P(MA-MAEO5) (30:70 and 70:30 co-monomers ratio) were synthesized by a free-radical copolymerization of methacrylic acid and poly(ethylene glycol) methacrylate methyl ether in THF initiated with AIBN. This acid copolymer was titrated with CTAOH (hexadecyltrimethylammonium hydroxide) to produce pure complex salts CTAP(MA-MAEO5).

Samples were analyzed visually and by SAXS (Small Angle X-Ray Scattering) experiments, showing that CTAP(MA-MAEO5)30:70 forms only disordered phases at a large range of concentration in water, as shown in the binary diagram (Figure 1). Both phases are isotropic and transparent, but L1 phase is formed predominantly by water and does not present any correlation peak, whereas L1’ is a viscous phase and presented a broad correlation peak, meaning that it is probably a micellar system. This is a very interesting result because this complex salt does not form a liquid crystalline phase at concentrations up to 86% wt. in water.

In the binary diagram of CTAP(MA-MAEO5)70:30 (Figure 1), a cubic phase is observed between 58% and 65% wt. of complex salt in water and at higher concentrations a hexagonal phase is formed. Comparing these results with the obtained by Bernardes et al. [1] for CTAPMA (without the grafted monomers), it is possible to verify that a higher concentration of CTAP(MA-MAEO5)70:30 is necessary to form a pure cubic phase.

![Binary diagram for the cited complex salts](image)

This study indicates that higher contents of grafted ethoxylated groups along the polymeric chain leads to formation of disordered phases in water, due to the hydrophilic character of these groups, confirming the success of this strategy.