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Properties of a new poly-ether-glycol copolymer

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Triblock copolymers are made of monomer segments, being the central part usually hydrophobic and the outer parts hydrophilic. By varying sizes, molecular weights and monomer types of the segments one obtains different final molecules, with different physico-chemical properties, which are directly related to the performance of the final product. Looking for new products to be used, among other possibilities, in biological applications, a new polymer (Figure 1) was synthesized by the Dow Chemical and studied by Size Exclusion Chromatography, Fourier Transformed Infrared Spectrometry, Small-angle X-ray Scattering (SAXS) and its cloud point was determined by measuring light transmittance. The studies showed low molecular polydispersivety, but different polarities in the macromolecules fractions. Due to the low solubility of Diol in water, a mixture of water/butyl diglycol was used as solvent. An extensive analysis by SAXS was performed for concentrations from 50 wt% to 80 wt% of Diol in solution. Small concentrations showed very low signal to noise ratio, making it impossible to be analysed. The scattering intensity including the form factor of polydisperse non-homogeneous spheres, and the structure factor of interacting hard spheres was fitted to the curves. As the polymer concentration is high, the fitting of form factors of direct and reverse micelles were compared. The results for direct micelles were better up to 80 wt%, whereas at 90 wt% and 95 wt% the curves were better fitted by reverse micelles. It might seem odd that direct micelles are present up to such high concentrations, but it might have been caused by the presence of butyl diglycol, which increases the solubility of Diol in water. The inner and outer radius of the micelles, electron density distribution, and interaction radius of the micelles were obtained. The polydispersivety increases with Diol concentration. Besides, the interaction radius increases with solvent concentration, even when reversed micelles are present. In the last case, accompanied by an increase of inner radius (water content), as there are fewer Diol molecules to involve the water nuclei, which become larger, further apart, and in less number.

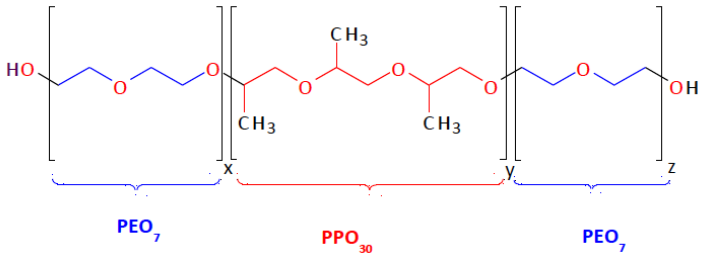

Figure 1: Structure of the new copolymer Diol.