Public defence of a Doctoral Thesis in Chemical Engineering

Cellulose dissolution and amphiphilicity: insights on the emulsion formation and stabilization

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Abstract

An amphiphilic polymer is expected to adsorb at the oil-water interface and be capable of stabilizing emulsions. Cellulose derivatives, cellulose nanoparticles and regenerated cellulose particles show an intrinsic amphiphilic character by self-assembling at oil-water interfaces and stabilizing emulsions without the aid of surfactants or any other co-stabilizers. In its polymeric form, the native cellulose chains could be expected to share similar emulsifying abilities. Cellulose dissolution is the main issue when it comes to its direct application in emulsion technology, and therefore, there is a lack of knowledge when it comes to this type of approach on making emulsions. Cellulose does not dissolve in either oil or water, but it can be dissolved in water based-solvents at extreme pH's. In this thesis, the interfacial behaviour of cellulose was studied at oil-water interfaces by having cellulose dissolved in aqueous solutions of H3PO4 (low pH) and NaOH/NaOH-urea and TBAH (high pH). In its dissolved state, cellulose was seen to substantially decrease the interfacial tension (IFT) between the oil phases and the water-based solvents, which was a consequence of the adsorption of cellulose at oil-water interfaces. The extent of the IFT reduction was shown dependent on the solvent quality. The optimal solvency conditions for cellulose were found for the alkaline solvent with an intermediate polarity (NaOH-urea), which is in line with the favourable conditions for adsorption of an amphiphilic polymer. Read the whole abstract on **www.miun.se**

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