ENZYMATIC SYNTHESIS OF NOVEL CARBOHYDRATE SURFACTANTS FOR WATER/SUPERCRITICAL CO_2 EMULSIONS.

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The use of aqueous dispersed environments, such as emulsions and miniemulsions, for chemical transformations and polymerization reactions has many advantages over solution processes, i.e. limited environmental impact, ease of products recovery and increased reaction rate. Processes in dispersed media are generally implemented from a water/organic solvent mixture with a surfactant. Nevertheless, supercritical carbon dioxide (Sc-CO_2) (Pc =74 bars; Tc = 31°C) constitutes an interesting alternative to the traditional organic solvents because it is inexpensive, non-toxic, non-inflammable and environmentally friendlier.[1,2]

In this context, we develop a novel class of surfactants able to stabilize water/Sc-CO_2 emulsions, i.e. fluorinated and silicone modified carbohydrates. The hydrophilic head of the surfactant consists in a sugar moiety whereas a fluorinated or polysiloxane tail will be specifically located in the Sc-CO_2 phase. The general strategy for the synthesis of these carbohydrates esters surfactants relies on lipase-catalyzed modifications[3] of sugars (mannose, glucose), which prevents many protection/deprotection steps. The synthesis and preliminary assessments of these surfactant properties will be presented. Ultimately, we plan to use these compounds as stabilizers for polymerization reactions carried out under water/Sc-CO_2 emulsion conditions.

References:

1) Wood C., Tan B., Zhang H., Cooper A., Ed. T.M. Letcher, "Supercritical carbon dioxide as a green solvent for polymer synthesis", in *Thermodynamics, Solubility and Environmental Issues*, **2007**, Chap 21, 383-396
2) Eastoe J., Gold S., Steyler D., Surfactants for CO_2, *Langmuir*, **2006**, 22, 9832-9842
3) Degn P., Pedersen L., Duus J., Zimmermann W., Lipase-catalysed synthesis of glucose fatty acid esters in tert-butanol, *Biotechnology Letters*, **1999**, 21, 275-280

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