## Synthesis and emulsifier properties of a new bio-sourced surfactant based on isosorbide

Maroua Ben Abdelkader<sup>1</sup>, Nedra Azizi<sup>1</sup>, Mejed Chemli<sup>1</sup>, <u>Yves Chevalier<sup>2,\*</sup></u>, Olivier Boyron<sup>3</sup>, Mustapha Majdoub<sup>1</sup>

<sup>1</sup>Laboratoire des Interfaces et Matériaux Avancés (LIMA), Faculté des Sciences, Bd de l'Environnement, 5019 Monastir, Tunisia.

<sup>2</sup>Laboratoire d'Automatique et de Génie des Procédés (LAGEP), Université Claude Bernard Lyon 1, UMR CNRS 5007, 43 bd 11 Novembre 1918, F-69622 Villeurbanne Cedex, France.

<sup>3</sup>Laboratoire de Chimie Catalyse Polymères et Procédés (C2P2), Université Claude Bernard Lyon 1, UMR CNRS 5265, 43 bd 11 Novembre 1918, F-69616 Villeurbanne Cedex, France.

## \*chevalier@lagep.univ-lyon1.fr

A facile and effective method for the preparation of a new cationic surfactant derived from isosorbide is introduced. The synthesis consists in condensation of isosorbide and epichlorhydrin yielding a low molar mass prepolymer (DGEDAS) and subsequent condensation to a fatty amine. The derived Dodecylamino Diglycidyl Ether of Isosorbide (DoDGEDAS) surfactant was characterized for its chemical structure using <sup>1</sup>H NMR and size exclusion chromatography. The use of oligomers of isosorbide provided water-solubility to the DoDGEDAS surfactant. It exhibited a low CMC and higher degree of micelle ionization compared with other cationic surfactants. O/W emulsions were prepared using this new bio-based surfactant and the influence of several parameters was investigated. A definite benefit of the DoDGEDAS surfactant was its ability to stabilize o/w emulsion droplets at lower concentrations (0.1%) than usual emulsifiers. The  $\zeta$  potential measurements proved a good stability of o/w emulsions and the cationic character of DoDGEDAS. The isoelectric point was at the alkaline pH 12.3, so that emulsion droplets were positively charged in the pH range of most practical applications. Thereby, such new cationic surfactants could be used for cosmetotextile applications and as fabric softeners or hair conditioners. The thermal stability of DoDGEDAS up to 300°C makes it suitable for applications at high temperatures, and its cationic character is a good starting point regarding applications requiring strong adsorption to negatively charged surfaces.



Figure 1 Reaction scheme for the synthesis of isosorbide-based surfactants.

[1] Synthesis and emulsifier properties of a new bio-sourced surfactant based on isosorbide. Ben Abdelkader M, Azizi N, Chemli M, Chevalier Y, Boyron O, Majdoub M; *Colloids Surfaces A* **2016**, *492*, 1-11. doi:<u>10.1016/j.colsurfa.2015.12.014</u>