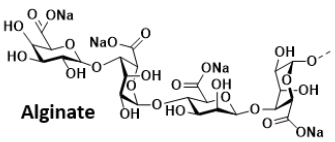
One-pot and biomass-agnostic syntheses of biodegradable surfactants from snionic polysaccharides

Thierry BENVEGNU [1], Damien MILLIASSEAU [1], Freddy PESSEL [2], Louse RENAULT [1], Daniel PLUSQUELLEC [1]

[1] Univ Rennes CNRS ISCR-UMR 6226 Ecole Nationale Supérieure de Chimie de Rennes Rennes F-35000, France, [2] SurfactGreen, France

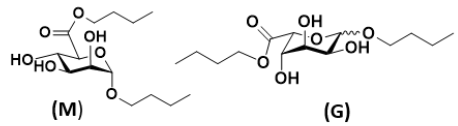
thierry.benvegnu@ensc-rennes.fr

During past decades, thanks to the use of renewable resources in chemical production, the focus has shifted towards the development of fully bio-based surfactants. These surfactants have been widely studied due to their good biodegradability and low toxicity and ecotoxicity. The most common ones are the alkyl polyglucosides (APG) which are non-ionic compounds with a production of 90000 t/a. However, the examples of anionic surfactants derived from renewable resources are scarce and the use of novel building blocks derived from sustainable resources to obtain the targeted properties is a major challenge for the surfactant industry. Therefore, the ENSCR (Ecole Nationale Supérieure de Chimie de Rennes) has led researches on the development of novel surfactants and green/blue chemical processes, using biomass from terrestrial or marine origin. These researches allowed the development of One-pot and Biomass-Agnostic syntheses of anionic or non-ionic sugar- or furanic-based surfactants derived from algal polysaccharides (ulvans, alginates, agarose) and pectins.[1-3] Physicochemical studies of these original sugar-based molecules have been achieved and clearly highlight the potential of these original materials as surface-active agents and emulsifying products. In addition, the readily biodegradablity and the absence of aquatic ecotoxicty make these surfactants very promising for cosmetic or personal care applications. Some reaction intermediates have been identified as potential biosourced 'platform' molecules.



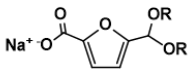
Alginate

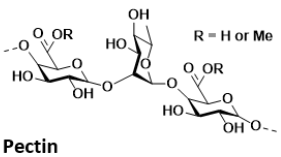
- 'One-pot' process
- Biodegradable acid catalyst
- Vegetable oils



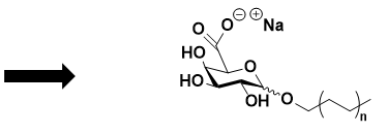
(M) **(G)**

Anionic surfactants D-mannunorate (M) and L-guluronate (G)





Pectin



Biodegradable and no Ecotoxicity

Anionic surfactant D-galacturonate

Bibliographic references:

(1) D. Milliasseau, J. Jeftić, F. Pessel, D. Plusquellec, T. Benvegnu (2021), Molecules (26) 1956.
(2) N. Sari-Chmayssem, F. Pessel, J. P. Guégan, S. Taha, H. Mawlawi, T. Benvegnu (2016), Green Chem. (18) 6573–6585.
(3) L. Renault, R. Marchal, B. Le Guennic, X. Roussel, P.-Y. Divet, T. Benvegnu (2021), Adv. Sustain. Syst. (5) 2100108.