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Preparation of end-functional oligosaccharides to develop novel bio-sourced amphiphiles

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PURPOSE OF THE ABSTRACT

Biomass as a renewable resource becomes increasingly important with the transition of our society and chemical industry towards more sustainable processes. Carbohydrates represent 75% of the annual production of biomass and are thus of particular interest.[1][2] To that purpose, the introduction of these biopolymers towards the fabrication of polymeric material becomes a demanding research area. Among them, polymeric surfactants represent an important class with challenges associated to their degradability and toxicity.

In this context, we have developed polysaccharide-based amphiphilic bioconjugates exclusively from renewable resources, employing oligomerization, depolymerization and functionalization of carbohydrates.

Two pathways were thus considered: i) simultaneous glycosylation and oligomerization of unprotected monosaccharides and ii) functionalization of terminal-free oligosaccharides obtained by ball-milling.[3] Within the first pathway we have developed a new synthetic strategy combining simultaneous glycosylation and oligomerization of simple sugars without the need of any protecting steps. Every step of this process was carried out with respect to the principles of green chemistry such as the prevention of any solvent and the utilization of recyclable catalysts so as ion-exchange resins (Amberlyst-15). The second pathway provided end-functional cellulose-oligosaccharides. Consequently, the combination of both strategies allowed a variation of the architecture and the sugar moieties of the end-functional oligosaccharides.

The so-obtained end-functional oligosaccharides were coupled with hydrophobic moieties such as fatty acids to prepare fully bio-based bioconjugates. Synthesis products were fully characterized using NMR, IR-ATR and MALDI-tof spectroscopies, GPC and GC-MS/GC-FID chromatographies.

FIGURES

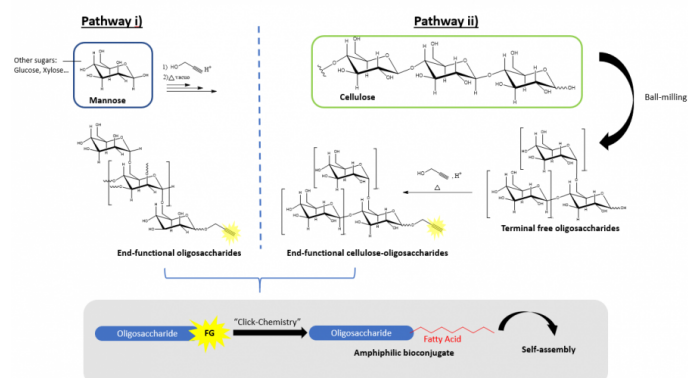


FIGURE 1

Synthetic pathways of the end-functional oligosaccharides

Synthetic pathways of the end-functional oligosaccharides

FIGURE 2

KEYWORDS

oligosaccharides | amphiphiles | fatty acids | self-assembly

BIBLIOGRAPHY

- [1] K. Muffler, R. Ulber, Use of Renewable Raw Materials in the Chemical Industry – Beyond Sugar and Starch, Vol. 31, 2008.
- [2] M. Benoit, A. Rodrigues, Q. Zhang, E. Fourné, K. De Oliveira Vigier, J.-M. Tatibouët, F. Jérôme, Angewandte Chemie International Edition 2011, 50, 8964-8967.
- [3] A. Karam, P. N. Amaniampong, J. M. Garcia Fernandez, C. Oldani, S. Marinkovic, B. Estrine, K. De Oliveira Vigier, F. Jerome, Front Chem 2018, 6, 74.