Session 5

Oral communication

**Enzymatically-synthesized alkyl pentosides and pentose-based esters, as surfactants of interest**

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Xylans are abundant polysaccharides in lignocellulosic biomass and their valorisation represents a key issue for the development of biorefineries. Xylans and their derivatives provide a large spectrum of applications in biorefineries, such as the production of fermentation products (ethanol, xylitol), prebiotics, or films for packaging materials [[1](#_ENREF_1)]. Finding new applications for pentose-based molecules is still of interest and challenging for the valorisation of lignocellulosic biomass.

In this context, our research is devoted to the enzymatic functionalization of pentoses into surfactants. Enzymatic pathways for the functionalization of sugars gain interest as they occur in one step with high selectivity. We developed a first approach dedicated to transglycosylation reactions catalysed by hemicellulases in the presence of alcohols. This allowed producing various alkyl pentosides and oligopentosides from xylans [[2](#_ENREF_2), [3](#_ENREF_3)]. In another approach, we developed the synthesis of pentose-based esters with lipases in presence of xylose, arabinose or xylo-oligosaccharides and esterified fatty acids [[4](#_ENREF_4)]. Synthesis of alkyl pentosides and pentose-based esters was also developed directly from lignocellulosic biomass such as wheat bran. Our results indicate that both alkyl pentosides and pentose-based esters exhibit interesting surfactant properties for applications as ingredients for detergency, cosmetics, ... Furthermore, these non-ionic bio-based surfactants are not toxic and are biodegradable. These studies are currently developed in the European Interreg ValBran project.

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2. Ochs, M., et al., *Enzymatic synthesis of alkyl beta-D-xylosides and oligoxylosides from xylans and from hydrothermally pretreated wheat bran.* Green Chemistry, 2011. **13**(9): p. 2380-2388.

3. Muzard, M., et al., *Evaluation of the transglycosylation activities of a GH 39 beta-D-xylosidase for the synthesis of xylose-based glycosides.* Journal of Molecular Catalysis B-Enzymatic, 2009. **58**(1-4): p. 1-5.

4. Méline, T., et al., *D-Xylose and L-arabinose laurate esters: enzymatic synthesis, characterization and physico-chemical properties.* Enzyme and Microbial Technology, 2018. **112**: p. 14-21.