LIPASE-CATALYZED SYNTHESIS AND PHYSICO-CHEMICAL CHARACTERIZATION OF ALKYL GLYCOSIDE FATTY ACID ESTERS FROM CHEESE WHEY PERMEATE

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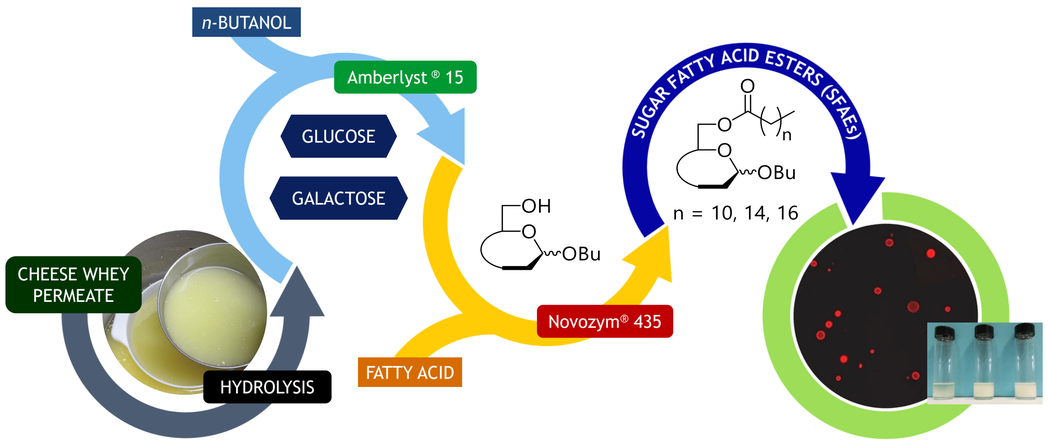
SUGAR FATTY ACID ESTERS (SFAEs) AS SURFACTANTS

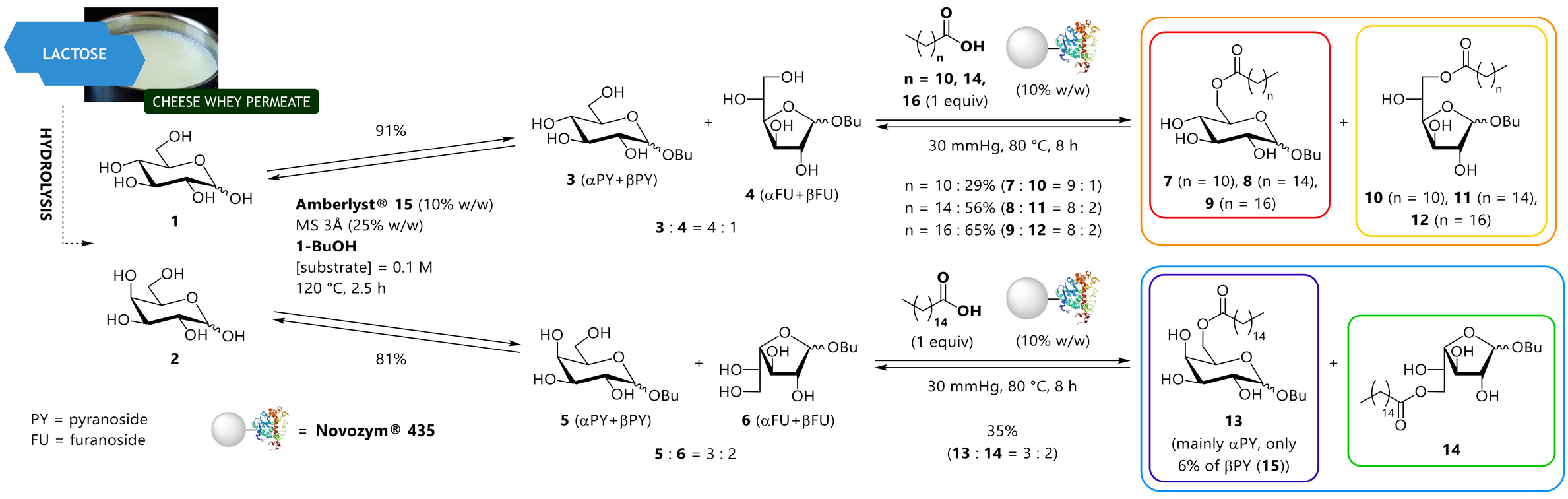


Sugar Fatty Acid Esters (SFAEs) are a promising class of non-ionic surfactants matching excellent emulsifying, stabilizing and detergency properties with striking advantages over their conventional counterparts (*e.g.,* they are non-toxic, fully biodegradable and environmentally friendly).[1] Since their current industrial synthesis requires harsh reaction conditions, usually resulting in complex mixtures of isomers and by-products,[2] biocatalytic strategies represent a potential alternative to circumvent these drawbacks.[3]

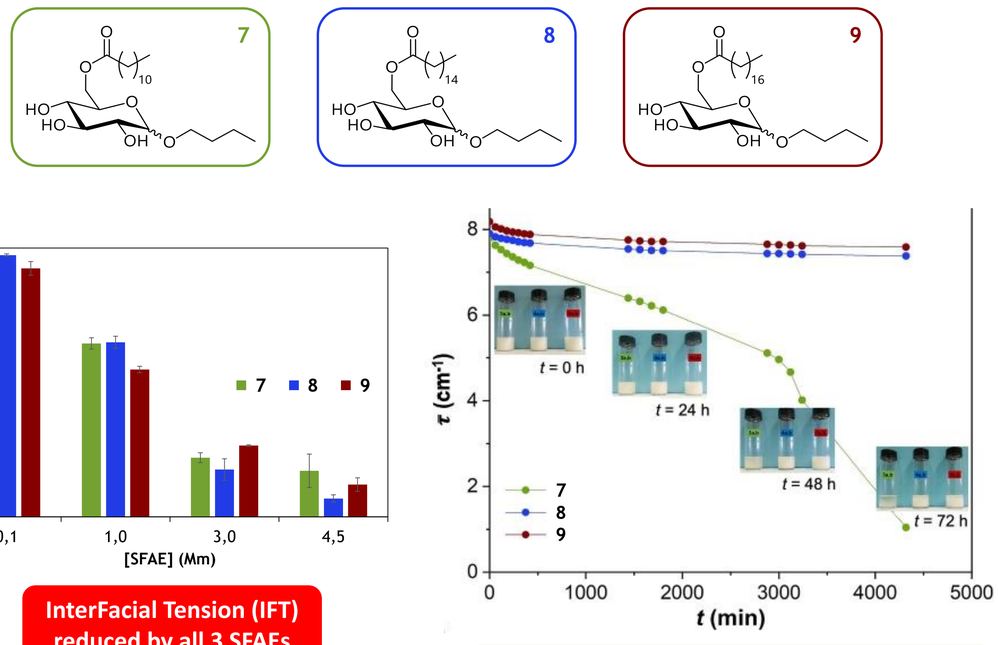
A library of SFAEs was chemoenzymatically prepared from glucose (**1**) and galactose (**2**), both obtainable by enzymatic hydrolysis of lactose-containing cheese whey permeate (CWP, a major waste of dairy industry), 1-butanol and fatty acids (lauric, palmitic and stearic). Key steps in this pathway are the Fischer glycosylation of the two sugars and the following esterification of the obtained mixtures of 1-butyl pyranosides and furanosides, catalyzed by the strongly acidic resin Amberlyst® 15 and Novozym® 435 (an immobilized lipase B from *Candida antarctica,* CalB), respectively.[4]

The physico-chemical properties of the obtained tensides (interfacial tension features, water/oil (W/O) emulsification capability and W/O emulsion stability over time) were then evaluated.[4]

CHEMOENZYMATIC SYNTHESIS OF 1-BUTYL 6-*O*-ACYL-D-GLUCOSIDES AND D-GALACTOSIDES

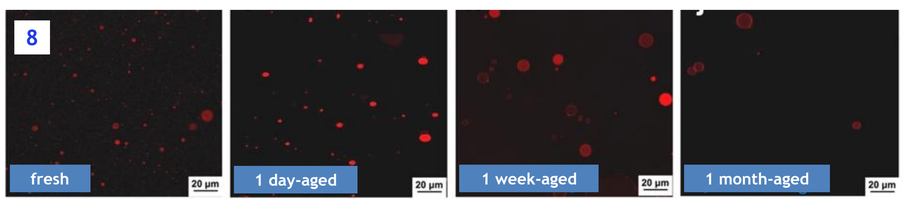


SURFACTANT PROPERTIES OF D-GLUCOPYRANOSIDIC SFAEs



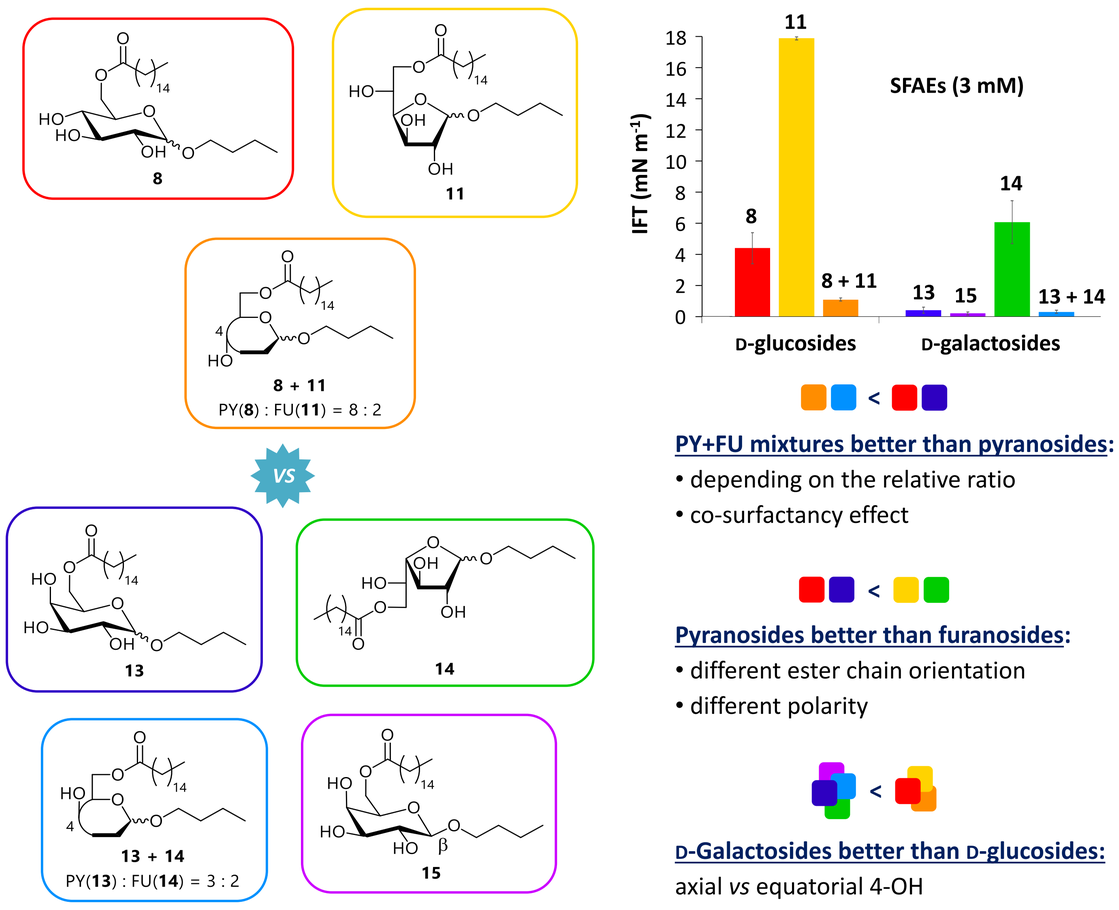
InterFacial Tension (IFT) reduced by all 3 SFAEs

8- and 9-based W/O emulsions more stable (sharp decrease in turbidity (τ) for 7)



Palmitoyl SFAE (8) efficiently stabilizes H_2O droplets in W/O emulsions (Confocal Microscopy images stained with Rhodamine B)

IFT: D-GLUCOSIDIC *vs* D-GALACTOSIDIC SFAEs



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