ON THE USE OF SURFACTANTS BASED ON GLUCIDIC UNITS FOR CLEANING OF PES MEMBRANES FOULED BY MILK PROTEINS.

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ABSTRACT

Skim milk ultrafiltration (UF) by polyethersulfone (PES) membranes is widely used in dairy industries to standardize the milk protein content. The high resulting fouling reduces fluxes, limits then the productivity and needs thus twice daily cleaning operations. The irreversible membrane fouling was previously identified as protein deposit that is the cleaning target. From a set of cleaning performed with various alkaline solutions at pH 11.5 and 50°C we proposed the selection of an efficient cleaning solution on the basis of its interfacial energy that must be close to 30 mJ.m^{-2} [1]. Commercial formulated detergent solutions usually used for this purpose are based on surfactants derived from fossil resources. In this study, a proposal is made using bio-surfactants (**Figure 1**) obtained from a non-solvent green chemistry and based on glucidic units, the latter coming from renewable resources. Dissolved at their CMC (critical micelle concentration) at pH 11.5 in NaOH, they lead to cleaning solutions with reduced interfacial energy (27-34 mJ.m^{-2}).

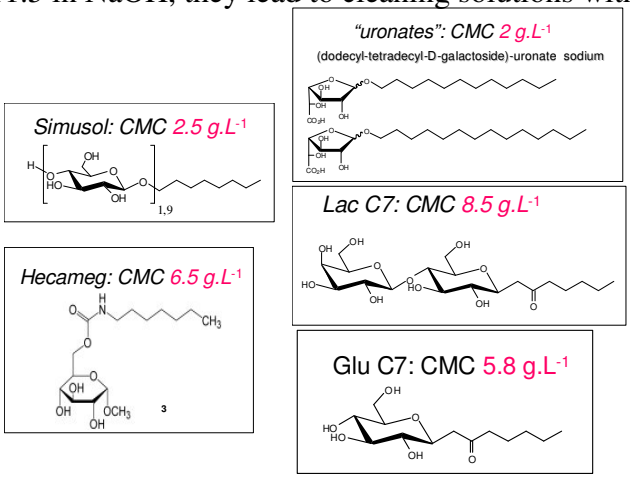

Figure 1: New surfactants used

cleaning solution	removed proteins (%)
NaOH	34
SDS 2 g.L^{-1}	96
Hecameg	86
Simusol	76
"uronates"	65
Lac C7	48
Glu C7	81

Table 1: Cleaning efficiency of cleaning solution

A 127 cm^2 PES membrane was firstly fouled during skim milk UF (2 bar, 50°C, 0.3 m.s^{-1}, occurrence of retentate and permeate spacers) and water rinsed on a plate and frame pilot. Then the intrinsic efficiency of solutions was evaluated by cleaning 14 cm^2 samples in stirred reactors 1h at 50°C with 150 mL cleaning solutions. The amount of proteins was measured directly on membrane coupons by FTIR-ATR according to a protocol previously described in [1]. Between 48% and 86% of proteins can be removed by such solutions. Performances were compared to that of single soda and that of an anionic surfactant, SDS (sodium dodecyl sulfate at its CMC) possibly entering in commercial detergent formulation. Encouraging results build up promising perspectives for these bio-cleaning products, particularly on an environmental point of view.

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References: [1] M. Rabiller-Baudry, L. Bégoin, D. Delaunay, L. Paugam, B. Chaufer, *Chem. Eng. Process*. 47 (2008) 267–275