Abstract Submission

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Topic : / Technological innovation for water management in the urban and industrial context (workshop) / ECCE10 / Water management in industrial processes

INTERFACIAL AND FOAMING PROPERTIES OF WASTEWATER

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Submit your abstract below (400 words): One of the most relevant problems in wastewater treatment industry concerns foam formation episodes that are recurrent, problematic and expensive to solve. The current challenge for these industries is to control the foam formation by a better understanding of these phenomena, in order to manage and adapt their processes. In this context, this works takes place in the framework of the MOCOPEE program, supervised by the SIAAP (the public service of Paris sanitationt), IRSTEA (Institut National de Recherche en Sciences et Technologies pour l'Environnement et l'Agriculture) and UTC (Université de Technologies de Compiègne), which is devoted to the development of a knowledge-based optimization of water treatment processes.
Foam formation is a complex phenomena associated with the presence of slowly biodegradable surfactants, extracellular polysaccharides produced by micro-organisms, and hydrophobic particles, which may adsorb to gas bubbles coming from the aeration process. This work aims at developing correlations between foam production and measurable physico-chemical properties of the complex media [1-2], in order to develop analytic tools enabling to detect the foaming ability of wastewater. Equilibrium and dynamic surface tension values are determined with the Wilhelmy plate and the maximum bubble pressure methods. The dilatational viscoelasticity of the system is explored with a drop profil tensiometer based on the oscillating bubble method at low perturbations [3-4]. The foaming stability are characterized according to a modified Bikerman method [1-2] on experimental lab device and commercial apparatus. Studies are performed on samples taken on the wastewater treatment plant and on model aqueous solutions prepared of a mixture of amphiphilic molecules, including surfactants, proteins and polysaccharides. First results on wastewater samples indicate that foaming samples are characterized by a low equilibrium surface tension (40-45mN/m) reached with a fast adsorption kinetics, contrary to the non-foaming samples, which slowly modify the interfacial tension. It suggests that their foaming ability is related to the presence of small amphiphilic molecules having good diffusion ability in water and effective surfactant properties. Future work will focus on relating the composition of wastewater samples to their foaming ability, by comparison to the behavior of models solutions of amphiphilic mixtures.

Type of presentation :: No preference

Highlight 1: Control of foam formation in wastewater treatment industry

Highlight 2: Correlation between interfacial and foaming properties of wastewater

Highlight 3: Measurement of equilibrium and dynamic surface tensions, and dilatational viscoelasticity

Reference 1 :: Davide Beneventi, Bruno Carre, Alessandro Gandini, Role of surfactant structure on surface and foaming properties, Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 189, Issues 1–3, 15 September 2001, Pages 65-73

Reference 2 :: Frederik J. Lech, Paulien Steltenpool, Marcel B.J. Meinders, Stefano Sforza, Harry Gruppen, Peter A. Wierenga, Identifying changes in chemical, interfacial and foam properties of β-lactoglobulin–sodium dodecyl sulphate mixturesOriginal Research Article Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 462, 20 November 2014, Pages 34-44

Reference 3 :: V.B. Fainerman, A.V. Mys, E.V. Aksenenko, A.V. Makievski, J.T. Petkov, J. Yorke, R. Miller, Adsorption layer characteristics of Triton surfactants: 4. Dynamic surface tension and dilational visco-elasticity of micellar solutions, Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 334, Issues 1–3, 20 February 2009, Pages 22-27

Reference 4 :: L.A. Trujillo-Cayado, P. Ramírez, L.M. Pérez-Mosqueda, M.C. Alfaro, J. Muñoz, Surface and foaming properties of polyoxyethylene glycerol ester surfactants, Colloids and Surfaces A: Physicochemical and Engineering Aspects, Volume 458, 20 September 2014, Pages 195-202

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