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TOXICITY OF SURFACTANTS FOR TWO BACTERIAL STRAINS ISOLATED FROM ACTIVATED SLUDGE

Daniel Mitru[1,2#], Iuliana Paun[1,2#], Catalina Stoica[1], Cristina-Ileana Covaliu[2], Gigel Paraschiv[2], Ioana Corina Moga[3], Gabriel Petrescu[3], Mihai Nita- Lazar[1]

[1]National Research and Development Institute for Industrial Ecology-ECOIND Bucharest, 71-73 Drumul Podu Dambovitei, 060652, Bucharest, Romania
[2]University POLITEHNICA of Bucharest, Faculty of Applied Chemistry and Materials Science, Department of Analytical, Chemistry and Environmental Engineering, no. 1-7, Polizu Street, RO-011061, Bucharest, Romania
[3]DFR Systems SRL, 46 Drumul Taberei Blvd., RO - 061392, Bucharest, Romania

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Introduction

The impact of the pollutants on the environment has been a major problem for the worldwide pollution management. The most common pollutants found in wastewater influents are anionic and cationic surfactants. Their increaded use of anionic surfactants in various activities (household products, foaming agents, petrochemical industry, and cosmetic formulation) induce a negative impact on the environment by affecting the operation of wastewaters treatment plants and the aquatic life in the surface water due to the foaming apparition. The cationic surfactants, especially benzalkonium chloride, may be contributing to the development of microorganisms with decreased susceptibilities to antibiotics and disinfectants. Therefore, it is necessary to know the toxicity effect of these compounds, in order to remove them from wastewater. Studies on the toxicity and biodegradation of surfactants using bacterial microorganisms are an important ecofriendly alternative to minimizing the impact on the environment. Several sciencific studies have showed bacterial strains capable of degrading cationic surfactants such as *Pseudomonas* sp., *Xanthomonas* sp. *Thalassospira* sp, *Aeromonas* sp. or anionic surfactants, *Pseudomonas beteli*, *Acinetobacter johnsoni*, *Citrobacter braakii*. This paper focused on the toxicity of surfactants on bacteria widely spread in the activated sludge of WWTP.

Materials and methods

Escherichia coli and *Salmonella enterica ss. enterica* referemce strains were used. Bacterial density was quantified at 600 nm using a spectrophotometer UV- 6300 PC (VWR, USA). A 0.2 bacterial density OD 600nm was incubated in absence (control) or presence of an anionic surfactant or a cationic surfactant for 24h at 37°C in a mild stired (130 rpm) Incubator New Brunswick Scientific, Innova 44 (USA).

Results and conclusions

The experiment was conducted using 2 concentration of both anionic and cationic surfactants as follows: *E.coli* and *S. enterica ss enterica* with anionic surfactant 10 mg/L and 25 mg/L (Figure 1) and *E. coli* and *S. enterica ss enterica* with cationic

surfactant 5 mg/L and 10 mg/L (Figure 2). In the presence of both bacteria (*E. coli* and *S. enterica ss. enterica*), the anionic surfactants had no influence on the bacterial growth during 24h of incubation (Figure1).

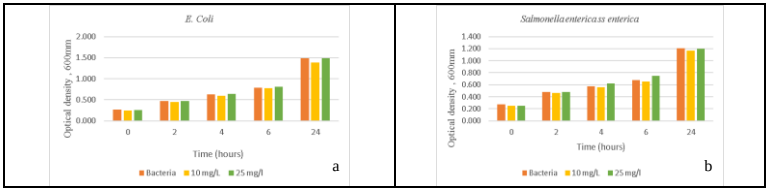

Fig. 1. Bacteria growth of *E. coli* (a); *S. enterica ss enterica* (b) in the presence of anionic surfactants

The results showed that the inhibitory effect of cationic surfactants on bacteria *E. coli* growth increases with increasing surfactant concentration (Figure 2a). The population of bacterial strains in presence of cationic surfactants decreased during 6 hours of incubation, but after 24 hours their growth increased progressively inversely with the concentration of cationic surfactant. The inhibition process of bacteria *S. enterica ss.enterica* for both cationic surfactant concentration levels increase up to 6 hours. At the end of the experiments (24h) the inhibitory effect was not significant for both concentrations tested (Figure 2b). For both bacterial strains (*E. coli and S. enterica ss.enterica*), the increase of bacterial population between 6 hours and 24 hours of incubation can be explained by bacteria have developed efficient adaptation mechanisms for surfactant concentration levels tested in experiments.

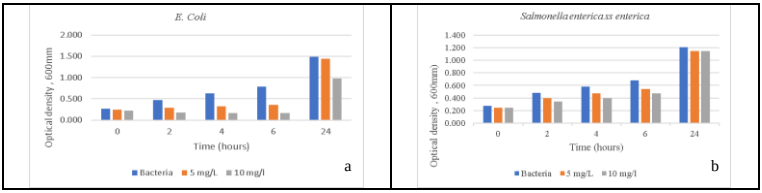

Fig. 2. Bacteria growth of *E. coli* (a); *S. enterica ss enterica* (b) in the presence of cationic surfactants

No toxic effects on both bacteria (*E. coli* and *S. enterica ss. enterica*, respectively) was observed in presence of anionic surfactants. The cationic surfactants at 10 mg/L concentration had an inhibitory effect of 33% over the *E. coli* bacteria. These results will be the basis for a study of the biodegradability of surfactants using these bacterial strains.

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