Invited article for a FESTSCHRIFT in honour of Prof. D.K. Chattoraj on his 85th Birthday

J. Surface Sci. Technol. *Vol 31(1–2), pp. 99–105, June 2015* *ISSN (Print) : 0970-1893*

Synthesis and Structure-Property Relationships of Bio-surfactants: A Short Review

P. Patra[1], D. Gunaseelan[2], R. Sen[2] and P. Somasundaran[1*]

[1]Department of Earth and Environmental Engineering, Columbia University, NY, 10027
[2]Department of Biotechnology, Indian Institute of Technology Kharagpur, West Bengal, 721302, India

Abstract

Surfactants are commonly used in many personal care, pharmaceutical and food products that humans and others come in contact with in our daily life. The impact of the surfactants on human health is of growing concern and has been recognized by industries, governments and the general public. Thus, there is recognition for the need for benign or "greener" surfactants. Surfactants are typically considered greener if they are acquired from natural sources and undergo greener processing routes. In this regard, greener surfactants are biosurfactants derived from microbes and plant. Bacteria produce a variety of surfactants, such as Emulsan, which is produced by gram-negative bacterium Acinetobacter calcoaceticus strain RAG-1, extracellular sophorolipids produced by Candida bombicola species, rhamnolipids produced by Pseudomonas aeruginosa in L-Rhamnosyl-L-Rhamnosyl-β-hydroxydecanoyl-β-hydroxydecanoate and L-rhamnosyl-β-hydroxydecanoyl-β-hydroxyd ecanoate forms, and lipopeptide produced by Bacillus subtilis. Furthermore, using today's advanced synthesis biological tools, bacteria can be genetically modified to produce surfactants with molecular structures for desired performance. For example, Bacillus subtilis strains can be developed which are capable of producing different types of fatty acid and glutamate based surfactants. These bio-surfactants exhibit surface active properties similar to conventional surfactants. It is to be noted that biosurfactant molecules are complex in terms of the surfactant functional groups and varying carbon chain lengths and understanding of the structure-property-performance relationships of these complex molecules is therefore key to their optimum usability.

Keywords: Alkyl Chain Length, Biosurfactants, Emulsan, Fatty Acid Glutamate, Green Chemistry, Rhamnolipids