# “Synthesis and comprehensive characterization of non ionic surfactants via PEG modification of the oleate moiety of palmolein oil”

## Abstract

Versatile and demand of huge market demanding the non ionic surfactants and Vesicles possessing poly (ethylene glycol) (PEG) chains on their surface have been described as a Polyethylene glycol (PEG) chains on the surface of oleic acid derivative. This study explores the synthesis and characterization of novel, biodegradable non-ionic surfactants derived from palmolein oil fatty acid methyl esters, a renewable resource. Palmolein oil fatty acid methyl esters, predominantly methyl oleate, were chemically modified to produce PEGylated derivatives with varying polyethylene glycol (PEG) chain lengths (molecular weights of 200, 400, and 600, corresponding to 7, 11, and 16 ethylene oxide units). The synthesis involved the conversion of methyl oleate to 9, 10-epoxy derivatives, followed by transformation into hydroxyl monomethyl-PEG ethers, achieving an 89% overall yield. The resulting surfactants exhibited excellent surface-active properties, with cloud points of 43, 55, and 64°C and critical micelle concentrations (CMC) of 2.6 and 2.0 mM. Surface tensions at the CMC ranged from 33 to 42 mN/m. Equilibrium surface tension and reflectometry measurements demonstrated enhanced alignment at the air–water interface compared to conventional surfactants, highlighting their potential for industrial applications.

Significantly the PEG chain length significantly influenced the surfactants' viscosity, stability, and physicochemical properties, making them versatile for use as emulsifiers, stabilizers, and drug delivery agents. These biodegradable surfactants underscore the potential of renewable vegetable oils for the development of sustainable, eco-friendly surfactant systems, contributing

to the advancement of green chemistry and environmental stewardship. This study presents the synthesis of biodegradable, non-ionic surfactants from palmolein oil, a renewable source. Utilizing heterogeneous catalysis and a solvent-free method, PEGylated surfactants were developed via epoxidation and ring-opening reactions. These surfactants exhibit excellent emulsifying, solubilizing, and stabilizing properties, making them ideal for food, cosmetic, and detergent applications.

## References:


1] Patel, A., & Mehta, P. (2020). Advances in biodegradable surfactants derived from vegetable oils: A green chemistry perspective. *Green Chemistry Letters and Reviews*, 13(4), 190-204.
2] Veronese, F. M., & Pasut, G. (2005). PEGylation, successful approach to drug delivery. *Drug Discovery Today*, 10(21), 1451-1458.
3] Gunstone, F. D., & Harwood, J. L. (2007). The utilization of renewable feedstocks for surfactant production: Emphasis on vegetable oils. *Journal of Surfactants and Detergents*, 10(3), 141-153.
4] Sheldon, R. A., & Arends, I. W. C. E. (2000). Green chemistry and catalytic epoxidation of olefins. *Chemical Reviews*, 100(4), 1447-1474.
5] Rieger, M. M. (2013). Surfactants in cosmetics. *Cosmetic Science and Technology*, 2, 5-12.
6] Rosen, M. J., & Kunjappu, J. T. (2012). Surfactants and interfacial phenomena (4th ed.). Wiley-Interscience. Radhakrishnan, A. N., & Nagarajan, R. (2009). Effect of chain length on the physicochemical properties of PEGylated surfactants. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 348(1-3), 98-104.