

Accepted Manuscript

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Matthew F. Paige, Ala'a F. Eftaiha

PII: S0001-8686(16)30371-2
DOI: doi: [10.1016/j.cis.2017.07.023](https://doi.org/10.1016/j.cis.2017.07.023)
Reference: CIS 1808

To appear in: *Advances in Colloid and Interface Science*

Revised date: ####REVISEDDATE###
Accepted date: ####ACCEPTEDDATE###

Please cite this article as: Matthew F. Paige, Ala'a F. Eftaiha , Phase-separated surfactant monolayers: Exploiting immiscibility of fluorocarbons and hydrocarbons to pattern interfaces, *Advances in Colloid and Interface Science* (2017), doi: [10.1016/j.cis.2017.07.023](https://doi.org/10.1016/j.cis.2017.07.023)

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Phase-separated surfactant monolayers: Exploiting immiscibility of fluorocarbons and hydrocarbons to pattern interfaces.

Matthew F. Paige^{1,*}, Ala'a F. Eftaiha²

¹ Department of Chemistry, University of Saskatchewan, Saskatoon, SK. S7N 5C9, Canada.

Tel: 1-306-966-4665, Fax: 1-305-966-4730, Email: matthew.paige@usask.ca

²Department of Chemistry, The Hashemite University, P.O. Box 150459, Zarqa 13115, Jordan

Abstract:

The mutual immiscibility of hydrogenated and fluorinated surfactants at interfaces frequently leads to phase-separation, which provides a useful and flexible method for patterning air-water and solid-air interfaces. In this article, we review recent advances in the use of hydrogenated-fluorinated surfactant mixtures to achieve interfacial patterning. For even relatively simple systems comprised of binary mixed monolayers of hydrogenated and perfluorinated fatty acids, a diverse range of film morphologies can be generated at the air-water interface and successfully transferred onto solid substrates. Systematic investigations reported over the past several years have allowed for correlation between the chemical structure of the film constituents with the gross film morphology and underlying crystalline structure of the films. Early thermodynamic models based on the interplay between dipole-dipole repulsion forces between charged headgroups balanced by line tension between phases that were formulated to describe phase-behaviour in simple phospholipid monolayer systems, have proven highly useful to describe morphologies for the immiscible surfactant blends. Beyond simple binary fatty acid mixtures, highly-structured films have also been reported in mixed phospholipid systems, which have found important application in controlling the physical, compositional and performance properties of lung surfactant mixtures, as well as in

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