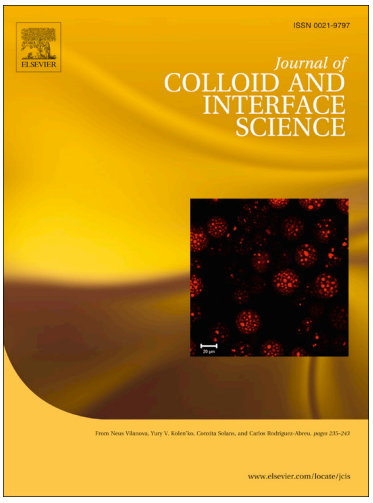
Accepted Manuscript



Formation, physicochemical and interfacial study of carbamate surfactants

Anna-Karin Hellström, Hans Oskarsson, Romain Bordes

PII: S0021-9797(17)31131-1
DOI: https://doi.org/10.1016/j.jcis.2017.09.100
Reference: YJCIS 22852

To appear in: *Journal of Colloid and Interface Science*

Received Date: 14 July 2017
Revised Date: 27 September 2017
Accepted Date: 27 September 2017

Please cite this article as: A-K. Hellström, H. Oskarsson, R. Bordes, Formation, physicochemical and interfacial study of carbamate surfactants, *Journal of Colloid and Interface Science* (2017), doi: https://doi.org/10.1016/j.jcis.2017.09.100

Formation, physicochemical and interfacial study of carbamate surfactants

Anna-Karin Hellström,[1] Hans Oskarsson,[2] Romain Bordes[1*]

[1] *Applied Chemistry, Department of Chemistry and Chemical Engineering, Chalmers University of Technology, Göteborg, Sweden*
[2] *AkzoNobel Surface Chemistry, Stenungsund, Sweden*

Email: anna-karin.hellstrom@chalmers.se; Hans.Oskarsson@akzonobel.com

Corresponding author:
**bordes@chalmers.se*
Phone: + 46 31 772 29 76
Fax: +46 31 16 00 62
Applied Chemistry, Department of Chemistry and Chemical Engineering, Chalmers University of Technology, Göteborg, Sweden

Abstract

Carbon dioxide is commonly used as pH regulator in switchable surfactant systems and in the formation of alkyl ammonium-alkyl carbamate ion-pair. Its use to form a meta-stable anionic surfactant has been less explored and can impart a cleavable character to the amphiphile.

The reaction between CO_2 and an alkylamine, N,N-di(propylamino)dodecylamine (Y12-amine), under alkaline pH conditions, produced a stable anionic carbamate-based surfactant (Y12-carbamate). By heating and exposure to N_2, anionic Y12-carbamate could slowly be reverted into Y12-amine. The surface activity of Y12-amine and Y12-carbamate was investigated by surface tension measurements. To study the behavior of Y12-amine at the gas-water interface during CO_2 exposure, we used the pendant drop technique with a sealed chamber where the gas composition could be controlled.

The Y12-carbamate had a higher CMC than Y12-amine at pH 12, and was also less surface active. The ion pair Y12-ammonium – Y12-carbamate, obtained at neutral pH, exhibited the lowest CMC and the highest surface activity. The interfacial formation of anionic Y12-carbamate induced an increase in surface tension. When CO_2 was exchanged to N_2, the migration from the bulk to the interface of Y12-amine induced a decrease in surface tension. The rate was dependent on the concentration of Y12-amine.

Keywords

Surfactant, anionic carbamate, amine, carbon dioxide, surface tension, interface, ion pair.