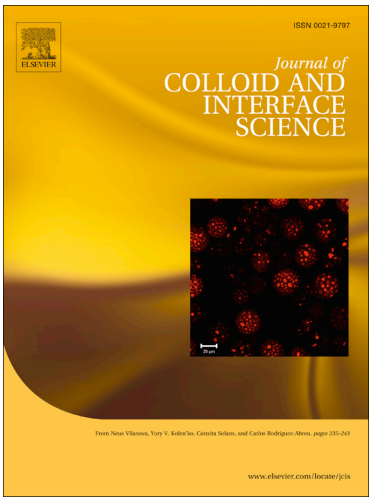

Regular Article

Effect of surfactant concentration on the responsiveness of a thermoresponsive copolymer/surfactant mixture with potential application on "Smart" foams formulations

M.M. Soledad Lencina, Eugenio Fernández Miconi, Marcos D. Fernández Leyes, Claudia Domínguez, Ezequiel Cuenca, Hernán A. Ritacco

PII: S0021-9797(17)31256-0
DOI: https://doi.org/10.1016/j.jcis.2017.10.090
Reference: YJCIS 22960

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

Received Date: 6 July 2017
Revised Date: 21 October 2017
Accepted Date: 23 October 2017

Please cite this article as: M.M. Soledad Lencina, E.F. Miconi, M.D. Fernández Leyes, C. Domínguez, E. Cuenca, H.A. Ritacco, Effect of surfactant concentration on the responsiveness of a thermoresponsive copolymer/surfactant mixture with potential application on "Smart" foams formulations, *Journal of Colloid and Interface Science* (2017), doi: https://doi.org/10.1016/j.jcis.2017.10.090

Effect of surfactant concentration on the responsiveness of a thermoresponsive copolymer/surfactant mixture with potential application on "Smart" foams formulations.

M. M. Soledad Lencina[a], Eugenio Fernández Miconi[a,b], Marcos D. Fernández Leyes[a], Claudia Domínguez[a,b], Ezequiel Cuenca[a] and Hernán A. Ritacco[(*)a,b].

[a] Instituto de Física del Sur (IFISUR-CONICET), Av. Alem 1253, Bahía Blanca (8000), Argentina

[b] Departamento de Física de la Universidad Nacional del Sur, Av. Alem 1253, Bahía Blanca (8000), Argentina.

(*) Corresponding author: hernan.ritacco@uns.edu.ar. Phone: +54 291 4595141

ABSTRACT.

Hypothesis: Previous efforts to formulate smart foams composed of mixtures of PNIPAAm, a thermoresponsive uncharged polymer, and surfactants have failed because the surfactant displaces the PNIPAAm from the liquid-air interface, removing the thermal responsiveness. We hypothesized that thermoresponsive foams could be formulated with such a mixture if a charged surfactant were used in order to anchor an oppositely charged brush-type polyelectrolyte, for which PNIPAAm could be incorporated as side chains, to the interface.

Experiments: A brush-type negatively charged co-polyelectrolyte (Cop-L) with PNIPAAm as side chains was synthetized. Its mixtures with DTAB, a cationic surfactant, in aqueous solution were characterized by dynamic light scattering, surface tension and surface compression viscoelasticity measurements, as a function of both surfactant concentration and temperature. The foam stability and its responsiveness to temperature changes were studied with a homemade apparatus.

Findings: The Cop-L/DTAB mixtures were capable of producing thermoresponsive foams but only in a very narrow surfactant concentration (c_s) range, $0.3 < c_s < 1.6$mM. The responsiveness is due to a modification of the interfacial compression elasticity induced by conformational changes of the Polyeletrolyte/surfactant aggregates at the interface. This is possible only for $c_s < 1.6$ because higher surfactant concentrations induce the polymer collapse at all temperatures, eliminating the thermal responsiveness.

Keywords: Polyelectrolyte-surfactants, foams, responsive foams, surface tension, surface rheology.