Direct optical detection of surfactants by means of micro-porous polymeric materials iso-refractive to water

Roberta Lanfranco[1] Fabio Giavazzi[1], Matteo Salina[2], Emanuele Di Nicolò[3] and Marco Buscaglia[1]

[1]Dipartimento di Biotecnologie Mediche e Medicina Traslazionale, Università degli Studi di Milano, Italy,

[2] Proxentia S.r.l., Milano, Italy

[3] Solvay Specialty Polymers, Research and Development Center, Bollate, Italy

email: roberta.lanfranco@unimi.it;

Surfactants are among the most relevant organic pollutants of water with threatening potential for the aquatic environment. More than 90% of all surfactants massively used in many products and processes are commonly removed in waste-water treatment plants, however trace amounts may be released into the environment [1]. We propose a new kind of optical sensor based on an amorphous fluorinated plastic iso-refractive to water barely visible in aqueous solutions. When a thin molecular layer with a different refractive index adsorbs at the interface, the intensity of reflected or scattered light markedly increases [2-4], hence enabling a simple and real-time detection. This concept has been applied to detect the presence of surfactants in environmental water [5], which spontaneously adsorbs on the hydrophobic fluorinated plastic surface. Based on these results, we designed and realized *phantom* micro-porous membranes and micro-particles made of the same fluorinated plastic, suitable for integration into a micro-fluidic chip to be embedded into a deployable monitoring platform. When soaked with water samples, the adhesion of surfactants on the inner surface of the membrane induces an increase in the scattered light. A theoretical model has been developed in order to quantitatively link the measured membrane turbidity to the amount of adsorbed surfactants and, ultimately, to the concentration of surfactant in the water sample.

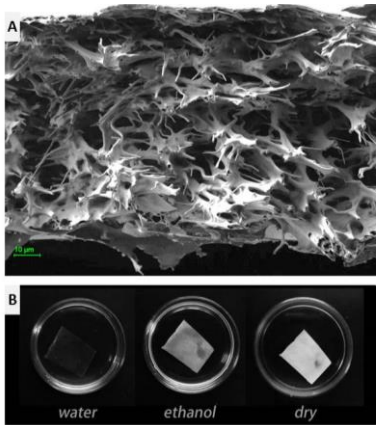

Fig.1: (A) SEM image of the cross section of a phantom micro-porous membrane.
(B) The turbidity of the membrane changes with the soaking liquid. In water the membrane is barely visible.

References

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