

**CATIONIC “GEMINI” SURFACTANTS
ADSORBED AT THE TiO₂-SOLUTION
INTERFACE. THE INTERPLAY
BETWEEN THE OXIDE SURFACE
POTENTIAL AND THE SURFACTANT
STRUCTURE.**

S. Ardizzone^{*a}, C.L. Bianchi, P.L.
Quagliotto^b, G. Viscardi^b

^a *Department of Physical Chemistry and
Electrochemistry, University of Milan,
Via Golgi 19, 20133 Milan, Italy.*

^b *Department of General and Applied
Organic Chemistry, University of Turin,
C.so M. D’Azeglio 48, 10125 Turin, Italy.*

Gemini or dimeric surfactants have been generating increasing interest owing to their superior performance in applications and their tunable molecular geometry. Geminis consist of two conventional single-tail surfactants whose headgroups are joined covalently by a spacer (usually hydrophobic) of variable length. These molecules show interesting properties both on applicative and fundamental grounds. In this latter respect they represent the link between conventional (monomeric) amphiphiles and polyamphiphiles and allow control of the distances between the surfactant head groups at the water-core interface in tridimensional aggregates.

The possibility to tailor the molecule structure and modulate the hydrophilic/hydrophobic components allow “gemini” surfactants to be considered very promising in studies concerning amphiphilic molecule adsorption at the solid liquid interface. Literature studies concerning these latter aspects are not numerous and concern, in the case of cationic “gemini”, only quaternary ammonium surfactants (1-4).

In our laboratory the adsorption features, both at the air-water and at the solid-liquid interface, of cationic alkyl-pyridinium surfactants have been previously investigated (5). Recently “gemini” alkyl-pyridinium surfactants with spacers of variable length and position (with respect to the headgroup) have been synthesised.

The present work is relative to “short” (0, 3) spacer molecules with different spacer-head-group relative positions. The molecule association behaviour in bulk solution and at the liquid-air boundary have been characterised by surface tension determinations. Adsorption isotherms, as a function of the electrification features of the adsorbent, have been obtained on aqueous

dispersions of titanium dioxide. Direct characterisations of the adsorbate have been obtained by surface spectroscopies.

The different results obtained from adsorption data at the fluid interface and from XPS analyses are cross-compared and integrated with characterisations performed at the solid-liquid interface in order to produce a congruent picture regarding the effects of the molecule structure on its orientation /co-area and reactivity.

References

- 1) R. Zana, H. Levy, D. Papoutsis, G. Beniart, *Langmuir*, 11 (1995) 3694-3698.
- 2) R. Zana, *Langmuir*, 12 (1996) 1208-1211.
- 3) E. Alami, G. Beinert, P. Marie, R. Zana, *Langmuir*, 9 (1993) 1465-1467.
- 4) Th. Dam, J.B.F.N. Engberts, J. Karthaus, S. Karaborni, N.M. van Os, *Colloids Surf. A*, 118 (1996) 41.
- 5) S. Ardizzone, C.L. Bianchi, P. Drago, D. Mozzanica, P. Quagliotto, P. Savarino, G. Viscardi, *Colloids Surf. A*, 113 (1996) 135.