DIPARTIMENTO DI CHIMICA

SAPIENZA
UNIVERSITÀ DI ROMA

Seminario di Dipartimento
15/12/2014 aula C (Istituto Cannizzaro) ore 16:00

Yeast-derived biosurfactants: self-assembly and applications in material science

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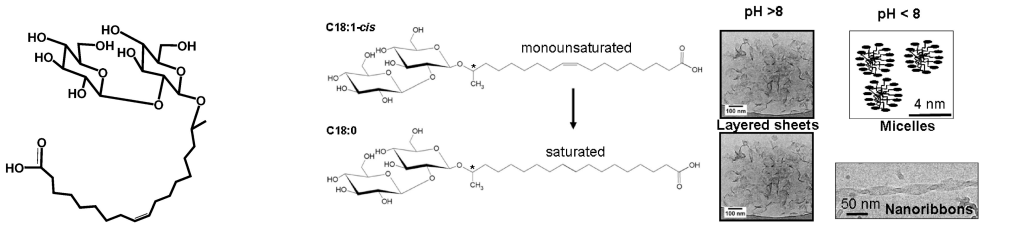
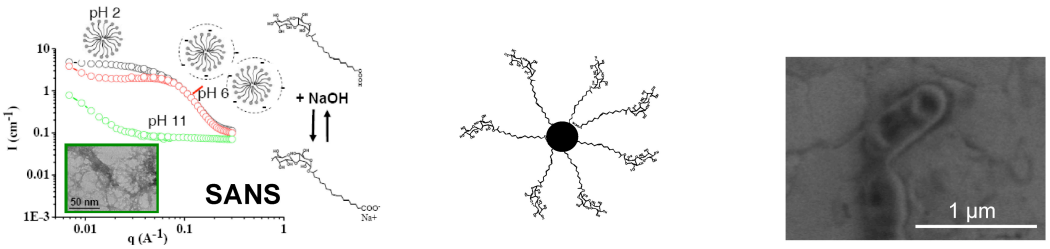
Sophorolipids are a class of biosurfactants belonging to the family of alkylglycosides and which are produced by the yeast *Candida bombicola* in presence of sugars, fatty acids and water. These compounds are developed at an industrial scale because of the high production rate, which is several hundred grams per liter of the yeast culture batch. If they are appealing to the cleansing and cosmetic industries, their potential is much larger.[1,2] Recent work discuss their antibacterial and anticancer properties and even some tests as polymer precursor were attempted. Specific applications in the field of material science also start to appear but the amount of work is still in its infancy.

This communication has the goal of showing the application of the acidic form of sophorolipids in the field of material science. Their self-assembly behaviour in water will be specifically highlighted and in particular its strong dependence on pH, including the effect of salt addition, temperature and molecular geometry. It will be shown that acidic sophorolipids may form either micelles or chiral fibers and even layered nanoscale sheets by simply playing with these parameters.[3,4,5] It will be shown how the knowledge of their self-assembly behaviour can be exploited to make mesoporous silica powders and thin films.[6] Other applications like stabilization of iron oxide nanoparticle [7] and surface antimicrobial agents will also be briefly discussed.



Acidic sophorolipids **Self-assembly: pH and molecular geometry dependency**



Micellar surface charge evolution with pH **Nanoparticle stabilization** **Surface antibacterial effects**

Fig. 1: Acidic sophorolipids: From self-assembly in water to antibacterial properties

[1] Desai, J. D.; Banat, I. M., *Microbiol. Molec. Biol. Rev.,* **1997**, 61, 47–64
[2] Develter, D.W.G.; Fleurackers, S.J.J. Surfactants from renewable ressources, Ed. M. Kjellin, I. Johansson, Wiley
[3] Baccile, N.; Babonneau, F.; Jestin, J., et al. *ACS Nano*, **2012**, 6, 4763–4776
[4] Baccile, N.; Pedersen, J. S.; Pehau-Arnaudet, G., et al. *Soft Matter*, **2013**, 9, 4911-4922
[5] Cuvier, A.-S.; Berton, J.; Stevens, C., et al. *Soft Matter*, **2014**, DOI:10.1039/C4SM00111G
[6] Baccile, N.; Nassif, N.; Malfatti, L., et al. *Green Chem.*, **2010**, 12, 1564-1567
[7] Baccile, N.; Noiville, R.; Stievano, L.; Van Bogaert, I., *PCCP.*, **2013**, 15, 1606-1620

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