DIPARTIMENTO DI CHIMICA

SAPIENZA
UNIVERSITÀ DI ROMA

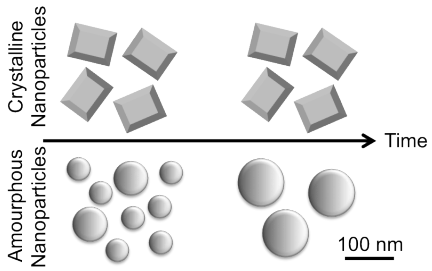
Seminario di Dipartimento
17/12/2014 aula A (Istituto Cannizzaro) ore 16:00

On the Ripening of Emulsions, Vesicles and Nanoparticles

Ulf Olsson

Physical Chemistry, Lund University, Box 124, SE-221 00 Lund, Sweden

Ostwald ripening is a common coarsening mechanism for phases fragmented to small submicron dimensions. Driven by interfacial energy, larger particles grow at the expense of smaller ones, that dissolve. For emulsions, this coarsening mechanism is well established. In emulsion systems with saturated surfactant films, the effective interfacial tension can be identified from Helfrich's curvature energy. The tension here is relatively small, allowing for accurate measurements of the ripening rate using time resolved small angle neutron scattering with proper contrast.[1] In vesicle systems, the situation is less clear. Vesicle dispersions are often very stable, and claims of thermodynamic stability have been made, based on the observation that the size distribution does not evolve with time. However, this can be understood from the fact that within the harmonic approximation, the vesicle curvature energy is independent of the vesicle size and, consequently, offer no driving force for ripening. Interestingly, when including higher order terms, curvature energy is expected to lead to an anti-coarsening where small vesicles grow at the expense of larger ones.[2] Thus, allowing for a narrowing of an initially broad size distribution into a more narrow steady state width determined by fluctuations. Amorphous solid nanoparticles are related to emulsions and are prone to undergo Ostwald ripening.[3] Crystalline nanoparticles, on the other hand, are not. The difference, which appears to be related to the actual mechanism by which the particles grow and dissolve, will be discussed in the light of recent experimental data.[4]



[1] S. Egelhaaf, U. Olsson, P. Schurtenberger, J. Morris and H. Wennerström *Phys. Rev. E* 1999, 60, 5681.
[2] U.Olsson and H. Wennerström *J. Phys. Chem. B* 2002, 106, 5135.
[3] L. LIndfors *et al. Langmuir* 2006, 22, 906
[4] M. A. Behrens *et al. in prep.*

Proponente Luciano Galantini

Università degli Studi di Roma "La Sapienza"
CF 80209930587 PI 02133771002
Prof. Luciano Galantini
Dipartimento di Chimica
P.le A. Moro 5, 00185 Roma
Tel (+39) 06 49913687 Fax (+39) 06 490631
luciano.galantini@uniroma1.it
www.uniroma1.it