
**Bilayers at the ILL**

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# Metallacarboranes as non-amphiphilic detergents for lipid membrane solubilization

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Metallacarboranes are a unique class of inorganic polyhedral clusters containing carbon, boron, hydrogen, and metal atoms. A typical metallacarborane is the nanometric size anion [COSAN]-: a Co3+ metal ion sandwiched between two [C2B9H11]2– (dicarbollide) clusters. In the last ten years we have shown that COSAN and its derivatives have all the properties of classical surfactants (surface activity, foaming, self-assembly in micelles/vesicles and lamellar lyotropic phase formation in water) although COSAN do not have any amphiphilic topology, i.e. a hydrophilic-hydrophobic sequence in their chemical structure. In the present contribution we show that COSAN derivatives are also able to fully solubilize (neutral) model artificial bilayers made of DOPC. SAXS has reavealed that the solubilization of DOPC by COSANs takes place with a continuous evolution in the shape of the DOPC/COSAN aggregates formed. The phase sequence which is obtained follows the evolution of structures with increased curvature from multilayer vesicles, to disc (comparable to bicelles), to elongated rods, to short rods, to core-shell spherical micelles (i.e. DOPC micelles decorated by COSANs) to COSAN micelle containing molecularly dissolved DOPC. In contrast to the classical solubilization process by surfactants (or detergents), which takes place by anchoring of their alkyl chains in the core of bilayers, COSAN derivatives show a different solubilization mecanism first by adsorbing at the bilayer surface and second by strongly disturbing the lipid packing which dramatically increases the curvature. The present results open new opportunities in solubilization and in the general understanding of the biological activity of COSANs and the underlying intermolecular forces involved.

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