INTERNATIONAL SOLVAY INSTITUTES BRUSSELS

Solvay Colloquium

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Université Pierre et Marie Curie - Collège de France

Biomimetism & Bio-inspiration: Sources of knowledge to create new materials

For the past five hundred million years nature has produced materials with remarkable properties and features such as the smart functionnal surfaces found in some leaves and flowers, the beautifully carved structures found in radiolaria or diatoms, the extraordinary mechanical and self-healing properties found in many composites. Another of nature's remarkable features is its ability to combine at the nanoscale (bio) organic and inorganic components allowing the construction of smart natural materials that found a compromise between different properties or functions (mechanics, density, permeability, colour superhydrophobia, porosity, etc.). Such a high level of integration associates several aspects: miniaturisation whose object is to accommodate a maximum of elementary functions in a small volume, hybridisation between inorganic and organic components optimizing complementary possibilities, functions and hierarchy. Current examples of natural organic–inorganic hybrids are crustacean carapaces or mollusc shells, bone or teeth tissues in vertebrates, byssus of mussels etc… As far as man-made materials are concerned, the possibility to combine properties of organic and inorganic components for materials design and processing is a very old challenge that likely started since ages (Egyptian inks, green bodies of china ceramics, prehistoric frescos, Maya Blue pigments etc.). However, to day bottum-up strategies allow to design the so-called hybrid organic–inorganic materials where organic and inorganic components are intimately mixed. It is obvious that properties of these materials are not only the sum of the individual contributions of both phases, but the role of the inner interfaces could be predominant. Hybrid materials based stategies are today generating smart membranes, new catalysts and sensors, new generation of photovoltaic and fuel cells, smart microelectronic, micro-optical and photonic components and systems, or intelligent therapeutic vectors that combine targeting, imaging, therapy and controlled release properties.

This plenary lecture will present a few striking examples of bioinspired functional materials built via bottum-up strategies. In particular analogies between, engineering and processing made by nature to construct performant materials and the today strategies used by materials chemists and engineers to produce modern materials through a kind of controlled design will be emphasized.

Tuesday 9 May 2017 at 4.00 P.M.

COFFEE AND TEA WILL BE SERVED AT 3.45 P.M. IN FRONT OF THE SOLVAY ROOM

SOLVAY ROOM

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