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BIOMIMETIC AND BIO-INSPIRED APPROACHES: A BETTER UNDERSTANDING OF NATURE TO CREATE NEW FUNCTIONAL MATERIALS THROUGH AND INTEGRATIVE CHEMISTRY APPROACH

Abstract: A better understanding of the construction mechanisms and structures of natural materials, and drawing inspiration from them, enables the creation of new materials and systems. Methods for developing inorganic or hybrid nanomaterials based on “gentle chemistry” involve “mineral polymerization” reactions in the broad sense and are carried out at room temperature. This type of approach makes it possible to simultaneously generate organic or biological components and mineral components in the same material, resulting in true organo-mineral hybrids or nanocomposites. Combining the properties of certain organic or biological molecules with those of mineral compounds in a single material has become an achievable goal. These cross-disciplinary approaches, in which molecular engineering and ingenious processes are synergistically combined, encompass biomimetic or bio-inspired synthesis strategies that enable chemists to develop complex systems of various shapes with perfect control over different scales of size, composition, functionality, and morphology. The creation of hybrid hierarchical architectures involves cross-disciplinary synthesis methods and clearly illustrates the central role of chemistry in the field of advanced materials. It is in this context, at the crossroads of “chemistry in all its forms,” physics, biology, and materials science, that a new field of investigation is developing concerning bio-inspired inorganic or hybrid materials. The design of these new functional materials, adapting their manufacturing methods to climate change, should enable a more sustainable future for the Earth. These strategies will highlight the analogies between natural and synthetic materials. In terms of applications, some organo-mineral hybrids or nanocomposites are at the development or prototype stage, while others are already on the market.

About the speaker: Today Clément Sanchez is Emeritus Professor of the Collège de France, chair named « Chemistry of Hybrid Materials » and Professor at USIAS (University of Strasbourg Institut of Advanced Studies) chair named Chemistry of ultradivided matter. He was Director of the “Laboratoire de Chimie de la Matière Condensée de Paris” (UMR 7574, University of Pierre and Marie Curie-Collège de France-CNRS) (1999-2013). He did a large part of his carrer at the CNRS where he was Director of Research studying ”chimie Douce” strategies to synthesize hybrid nanomaterials. He was also Professor at l'Ecole Polytechnique

during 12 years. He received an engineer degree from l'Ecole Nationale Supérieure de Chimie de Paris in 1978 and a “thèse d'état” (PhD) in physical chemistry from the University of Paris VI in 1981. He did a post-doctoral work at the University of California, Berkeley, and is currently performing research at Paris Sorbonne University, at the University of Strasbourg and at the University of Bordeaux. He is specialized in the field of nanochemistry and physical properties of nanostructured porous and non-porous transition metal oxide-based gels and porous and non-porous hybrid organic inorganic materials shaped as monoliths, microspheres and films. Most of his synthesis strategies are bioinspired and use manufacturing methods adapted at best to climate change. He was the chairman organizer of numerous international meetings associated to the field of soft-chemistry (Chimie douce), hybrid materials and related bio-aspects. He was the recipient of several national and international awards and he is member of several Academies of Sciences. For a more complete CV and more informations about his different awards please see:
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