Chemistry of Organo-Hybrids

Research in the area of hybrid materials has received increased attention in recent years. However, what do we actually mean by "hybrid materials"? According to a commonly used definition, hybrid materials are defined as nanocomposites in which at least one of the components bound to each other has dimensions on the order of several Angstroms up to the nanometer scale. A typical scenario would be a combination of components from different traditional areas of chemistry, such as inorganic oxide nanoparticles covalently coated with organic polymers. The dimensions and chemical functionality of the individual components define the new properties obtained for such hybrids. However, nature has been doing it all along: wood, mother of pearl, dentin, or bones are all high-performance natural hybrid materials. Synthetic hybrid materials are, therefore, expected to provide improved materials properties in areas such as optics or medicine.

What do we expect from a book entitled *Chemistry of Organo-Hybrids*? In the preface of this multi-author monograph, the editors define the term "organo hybrid" "as a material made by linking polymeric, carbon-rich or inorganic materials to organics (small molecules or macromolecules)". Even though this definition is a little vague, most of the chapters in the book do fall under that umbrella. The book contains chapters on the functionalization of carbon-based materials (nanotubes, graphene, and nanodiamonds), inorganic materials (titania, surfaces of zirconia, metal–organic frameworks (MOFs), and surfaces of colloidal semiconductor nanocrystals), biopolymers (nucleic acids, proteins, and cyclodextrins) and, finally, polymers (a chapter on general polymer functionalization, polymer–protein conjugates, and phosphorous dendrimers).

Wiley already has two books with similar titles in print: *Functional Hybrid Materials* (2004) and *Hybrid Materials* (2007). So how does the new book differ? While the previous titles are general introductory texts regarding the subject of hybrid materials, the current book focuses on two main topics: synthesis and characterization. It is ultimately a reference book for the practitioner who wants a quick overview of the possible functionalization methods for a particular nanoobject. Subsequently, many of the figures in the book show reaction schemes describing functionalization reactions of nanoobjects or analytical schemes proving their successful covalent attachment.

Many chapters of the book are structured in a systematic textbook-like manner, including the chapters on functionalization of carbon nanotubes, graphenes, and nanodiamonds, whereby the reader is systematically introduced to the various known functionalization methods, whilst learning about the reaction conditions and how to analytically prove the synthetic success.

Amongst the chapters dealing with inorganic objects, the functionalization of zirconia surfaces must be emphasized. A clear structure of the text provides a good introduction to the topic. The chapter on MOFs is conveniently organized by the type of organic functional group that can be introduced into the MOF scaffold.

The chapter on surface chemistry of colloidal semiconductor nanocrystals almost exclusively deals with CdSe nanocrystals. The authors present different ligand types with different binding strengths and describe analytical methods for the determination of surface ligands, ligand exchange and evaluation of binding strengths.

The section on biopolymers with the covalent attachment to nucleic acids or the chemoselective modification of virus capsids is well-presented. Naturally, there is some overlap in the chapters on polymer–protein conjugates and the modification of virus capsids. The longest chapter of the book on post-polymerization modification of synthetic polymers is also worthy of a mention. It gives a thorough overview of many synthetic methods available today, which is emphasized by more than 260 references for this chapter alone.

A whole chapter on cyclodextrin–metal hybrids appears to be a little less general than many of the other chapters. The shortest chapter of the book on hybrid-materials from phosphorous dendrimers is more of a review of the author's own research work and lacks the systematic treatment of synthesis and characterization so strictly followed by most other chapters.

In summary, this book delivers what it claims on the cover. It does not claim to be an introductory text on organo-hybrid materials but a reference book on synthesis and characterization. A solid book cover, an appealing layout and the overall good quality of the figures and chemical structures makes this book a very pleasant read.

Andreas F. M. Kilbinger
University of Fribourg (Switzerland)

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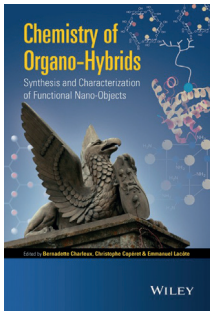

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