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FOUR CONFERENCES

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Mots-clés : chemistry, atom, polymerization

Cycle de quatre conférences prononcées les 11, 18, 25 mai et le 2 juin 2016 (invitation sur proposition du Pr Clément Sanchez). Certaines conférences sont disponibles en audio ou en vidéo sur le site internet du Collège de France : <https://www.college-de-france.fr/site/clement-sanchez/guestlecturer-2015-2016.htm>.

ATOM TRANSFER RADICAL POLYMERIZATION – FROM MECHANISM AND SYNTHESIS TO MATERIALS AND APPLICATIONS

A general introduction to controlled radical polymerization is followed by discussion on mechanistic and synthetic aspects of atom transfer radical polymerization (ATRP). Then some examples of polymers with controlled architecture are illustrated by molecular brushes with more deep discussion of their properties and potential applications. A few examples of hybrid materials and bioconjugates are provided. Finally, some commercial applications of polymers made by ATRP are reviewed.

TAMING RADICALS BEHAVIOR IN CONTROLLED RADICAL POLYMERIZATION

Fundamentals and peculiarities of radical polymerizations with reversible deactivation are discussed in detailed with emphasis on systems with persistent radical effect. This is followed by structure reactivity correlation for alkyl halide initiators, catalysts, solvents and other additives needed for ATRP at low concentration of Cu catalysts. The selection of initiators and catalysts for ATRP of various monomers and under various conditions is reviewed.

PRECISE POLYMER ARCHITECTURE BY MACROMOLECULAR ENGINEERING

Three aspects of architectural control including polymer composition, topology and functionality, are discussed and illustrated by block, gradient and periodic copolymers, stars, combs, (hyper)branched and network systems as well as various functional polymers, such as telechelics, functional miktoarm stars and STEM gels. All components of polymer architecture are precisely designed and synthetically carried out using concepts of macromolecular engineering.

FUNCTIONAL HYBRID AND BIOCONJUGATE MATERIALS BY ATRP

Several examples of organic/inorganic hybrid materials based on growth of precisely controlled polymer chains covalently attached to inorganic substrates including nanoparticles, flat and cylindrical substrates are discussed together with their properties and applications. In a similar way, various bioconjugates with proteins and nucleic acid were prepared via different techniques. Their properties and applications are presented. Future trends in synthetic polymer chemistry are reviewed.
