



SC

CHIM3410 Polymères de spécialité

[22.5h]

Ce cours bisannuel est dispensé en 2004-2005, 2006-2007,...

Langue d'enseignement : français

Niveau : cours de 3ème cycle

**Objectifs (en terme de compétences)**

Enseignement de troisième cycle à périodicité bisannuelle visant à enseigner les développements récents dans les domaines de la synthèse et de la caractérisation des polymères de spécialité. L'aspect théorique des problèmes sera également abordé.

**Objet de l'activité (principaux thèmes à aborder)**

Le contenu de cet enseignement diffèrera d'année en année ; il abordera notamment les aspects suivants : - les nouveaux monomères, les nouvelles méthodes de synthèse et de fonctionnalisation des polymères ; - les polymères à haute valeur ajoutée ; - les systèmes organisés (cristaux liquides, polymères amphiphiles,...) ; - les polymères à réponse induite ("responsive polymers") ; - les problèmes liés à la dégradation et au recyclage des polymères.

## Résumé : Contenu et Méthodes

1ère partie (V. Abetz, Univ. Bayreuth)

"Block copolymers"

Block copolymers represents an unique class of polymeric materials, that attracts a lot of interest due to their numerous valuable applications both in the industrial and academic communities. Because the constituting blocks of block copolymers are generally immiscible, phase separation is observed in these polymers, that is however spatially limited because the different blocks are linked together. The length scale of the phase separation is of the order of a few tenths of nanometers. This motivates the use of block copolymers in nanomaterials.

In the present course, several aspects of block copolymers will be highlighted, ranging from synthesis to theory and material science. This is summarized by the following contents :

1. Synthesis of Block Copolymers
2. Theory of Block copolymer Morphologies
3. Experimental Results on Block Copolymer Morphologies
4. Block Copolymer Blends
5. Block Copolymers in Composite Materials
6. Block Copolymer Structures in Solution

2ème partie (U.S. Schubert, Univ. Eindhoven)

The combination of supramolecular and polymer chemistry is on recent approach towards welldefined functional materials. For this purpose, non-covalent interactions are combined with covalent chemistry to construct new polymeric systems. Besides hydrogen bonding units and ionic interactions, mainly metal-ligand interactions have been utilized, As a result, linear high molar mass polymers, defined block copolymers, star-like systems, graft copolymers and micelles as well as networks were reported. In particular the reversibility of the supramolecular interaction is of special interest due to potential applications such as smart materials, reversible glues or adhesives as well as switchable systems. The binding strength of the non-covalent bond is weaker than a covalent bond and can be reverted under much milder conditions. Depending on the nature of the utilized interactions, properties such as thermal stability, photochemical behavior, viscosity or E-modulus of the resulting polymers can be tuned.

The course will provide a state-of-the-art overview about non-covalent bonds and interactions, the design and synthesis of supramolecular polymers, characterization methods as well as selected properties. Finally, applications will be discussed.

Selected references :

J.-M. Lehn, *Macromol. Chem., Macromol. Symp.* 1993, 69, 1-17; U. S. Schubert, M. Heller, *Chem. Eur. J.* 2001, 7, 5252-5259; L. Brunsveld, B. J. B. Folmer, E. W. Meijer, R. P. Sijbesma, *Chem. Rev.* 2001, 101, 4071-4097; L. R. Rieth, R.F. Baton, G. W. Coates, *Angew. Chem.* 2001, 113, 2211-2214, *Angew. Chem Int. Ed.* 2001, 40, 2153-2156; U. S. Schubert, E. Bschbaumer, *Angew. Chem.* 2002, 114, 3016-3050, *Angew. Chem. Int. Ed.* 2002, 41, 2892-2926; B. G. G. Lohmeijer, U. S. Schubert, *Angew. Chem.* 2002, 114, 3980-3984, *Ang. Chem. Int. Ed.* 2002, 41, 3825-3829.