

Functional materials for membranes and coatings

ECTS	Course (h)
3	18

Mention du master transmettant la fiche UE :	Chimie et Sciences des Matériaux
Composante de gestion de l'UE :	Faculté des Sciences – Département de Chimie
Responsable de l'UE :	Eliane ESPUCHE
Statut du responsable :	PR

REQUIREMENTS

Dood knowledge of polymer synthesis and microstructure

PROGRAMM

The program will consist in describing the new strategies of development of polymeric materials as well as the strategies of their implementation/shaping to obtain thin films, membranes or coatings with controlled function properties or even multifunctions and this in connection with the mechanisms governing the targeted functions. These strategies will be addressed in the context of:

- membranes for the transport, separation or storage of small molecules: in this part, we will define the interaction/diffusion mechanisms at the origin of the transport of small molecules (gas-water) in polymer films. We will present the experimental methods allowing to measure these properties. We will explain the influence of the materials physicochemical and morphological parameters on the membranes transport parameters. The routes to adapt materials to barrier, separation or storage functions, which are of great interest for both energy and transport fields, will be illustrated through the approaches based on the synthesis/modification of specific chemical structures, multilayer and composite materials.
- Coatings: In this part, we will focus on how to adapt a coating to given surface properties. We will illustrate in particular the parameters of interest (chemical composition, surface structuring...) for superhydrophobicity.
- thin films: in this part, we will deal with the elaboration and characterisation of functional polymer thin films, particularly in the context of the development of photo-lithography techniques for the microelectronics field. The advances and main developments that have enabled miniaturisation and the numerous technological evolutions that have allowed us to move from the first personal computers to the latest generations of processors, memories, hard disks and display screens will be contextualised in relation to the associated macromolecular engineering strategies. The implementation and characterisation techniques of nanostructured thin films on which these developments are based will also be discussed

SPECIFIC SKILLS

- To be able to define the gas transport parameters, to describe the techniques for characterising the transport properties of gases in polymers and to analyze the structure-property relationships
- To know how to adapt a material to the barrier function or the selectivity function
- To know the parameters that can influence the surface properties of a polymer and the methods used for determining these properties
- To know the macromolecular engineering strategies used for photo-litography application
- To know the elaboration and characterisation techniques of nanostructured thin films

Transversal skills

- Synthesis skills
- Critical thinking
- Ability to extract relevant information from a scientific publication on polymer formulation
- Ability to communicate concisely the content of a scientific publication