

Sol-Gel coating: Materials – Process - Properties

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 :	Bérangère TOURY
Statut du responsable :	MCF

REQUIREMENTS

Inorganic chemistry: M1-Materials or M1 Chemistry

Notion of solid thermomechanics (stresses-strains-elasticity-plasticity, thermal conduction) (UE TC4)

Material characterization methods: M1-Materials or M1 Chemistry

PROGRAM

Objectives: At the end of this course, the student will be competent, in a problem of surface functionalization of a part, to define a specification of Materials-Processes surface treatment taking into account multiple constraints (performance of the part, ecodesign, cost, etc.). Based on these specifications and knowledge of the coating behavior (in particular thermomechanical), he will be competent to implement a sol-gel coating development process as well as to characterize its properties.

The surface functionalization of industrial parts is a major challenge for innovation. However, the characteristics of the materials in the state of coatings and the fact that they adhere to the substrate, lead to specific behaviors which may be different from those in the solid state. Thus, both in the design and in the choice of the surface treatment process and characterization techniques, specific approaches must be carrying out. Among these different techniques, the sol-gel process offers many advantages.

This course focuses firstly on taking into account the specificities of materials in the state of thin or thick layers, and understanding, with regard to their functionality, their design as multilayer lamellar composite structures. Second, to present the different deposit techniques and their main characteristics. Finally, to study the sol-gel coating development process, the properties of these coatings as well as the associated characterization techniques. Emphasis will be placed on the relationships between the properties of solutions and those of derived materials

SPECIFIC SKILLS

- Master the definition of specifications for carrying out surface treatment
- Master the relationships Materials - Process (sol-gel) - Properties
- Know the different families of surface treatment processes as well as their main characteristics
- Know the fundamentals of the sol-gel process (synthesis, mechanisms, catalysis ...)
- Know the most common coating processes (dip-coating, spin-coating, etc.)
- Know hybrid materials and porous materials
- Know different techniques for characterizing sol-gel coatings