COURSE DETAIL

MATERIALS CHEMISTRY
Country Italy
Host Institution University of Bologna
Program(s) University of Bologna
UCEAP Course Level Upper Division
UCEAP Subject Area(s) Materials Science Engineering Chemistry
UCEAP Course Number 160
UCEAP Course Suffix
UCEAP Official Title MATERIALS CHEMISTRY
UCEAP Transcript Title MATERIALS CHEMISTRY
UCEAP Quarter Units 6.00
UCEAP Semester Units 4.00

Course Description

This course is part of the Laurea Magistrale program. The course is intended for advanced level students only. Enrollment is by consent of the instructor. The course focuses on the principles of chemistry and how they apply to the behavior of solid states. Special attention is placed on electronic structure, chemical bonding, and crystal structure. The course discusses topics including amorphous and crystalline solids, symmetry, lattices, and silicates; bonding in solids, ionic solids, the role of ion size, Shannon-Prewitt model for ions, transition metal compounds and non-bonding electron effects, crystal field theory, and band model for metals and semiconductors; crystal defects and non-stoichiometry, role of point defects in diffusion in solids, ionic conductivity, and some important solid-state electrolytes for batteries and fuel cells; catalysts for polymer production: radical initiators, Ziegler-Natta and metallocene catalyst in polyolefin production, branching in polyethylenes: origin and influence on polymer properties, and catalysts for step-growth polymerization: transition metals in polyester production; biobased and/or biodegradable polymers: production, properties, and main applications; chemisorption and activation on transition metals, interaction models based on HOMO-LUMO, and examples of relevant industrial applications: CO activation; carbon based materials, conducting polymers, structure, and properties, materials for secondary Li-based batteries, anodes, cathodes, and electrolytes, Li-ion vs Li metal batteries, fuel cells, materials for anodes, cathodes, electrolytes, and bipolar plates, proton conducting polymers for fuel cells electrolytes, fullerenes and fullerides, synthesis and properties, carbon nanotubes, graphene, and their application in polymer nanocomposites; and layered solids, layered double hydroxides, clays, and their modification to improve the compatibility with polymers, preparation of polymer nanocomposites using organoclays, flame retardant properties of LDH and organoclay based polymer nanocomposites.

Language(s) of Instruction
English

Host Institution Course Number
87126

Host Institution Course Title MATERIALS CHEMISTRY
Host Institution Campus BOLOGNA
Host Institution Faculty ENGINEERING
Host Institution Degree LM in Chemical Engineering
Host Institution Department ENGINEERING

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