

# Electrochemical energy storage and conversion

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16 hours (2 cfu) 15-16-17-18-22-23-24-25/07/2019 14.30-16.30

8 hours (1 cfu) October 2019

## **Aims**

Aims of the lectures are to supply the student with base knowledge about the physical chemistry of electrochemical systems and their application in the energy production and conversion.

## **Contents**

Thermodynamics and kinetics in electrochemical systems. Transport in electrolytes. Electrified interfaces. Supercapacitors, lithium-ion batteries, post-lithium batteries, redox-flow batteries, fuel cells, electrolyzers.

## **Detailed program**

Fundamentals of Electrochemistry: electrochemical thermodynamics and Nernst law; electrochemical potential; transport of charged species in solution and diffusion potential drop; double-layer theories and adsorption phenomena; electrochemical kinetics and overvoltage; heat generation in electrochemical systems.

Electrochemical energy storage and conversion: hydrogen economy; supercapacitors and pseudocapacitors; lithium-ion batteries; post-lithium-ion batteries; redox-flow batteries; polymer electrolyte membrane fuel cells; alkaline electrolyzers. Materials and configurations.