ChE-407

Electrochemical engineering

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Cursus	Sem.	Type
Energy minor	E	Opt.
Ing.-chim.	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	During the semester
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Use thermodynamics, electrochemical kinetics, electrocatalysis and notions of transport phenomena in the design of electrochemical reactors. Application in electrosynthesis and fuel cells. Presentation of examples of industrial processes

Content

- Electrochemical thermodynamics, application to fuel cells.
- Electrochemical Kinetics (Bulter-Volmer and Marcus models).
- Electrochemical kinetics; application to fuel cells.
- Transport phenomena in electrochemistry (determination of the mass transfer coefficient).
- The rotating disk electrode.
- The electrochemical reaction engineering.
- The optimum current density for galvanostatic operation.
- Distribution of current and potential in an electrochemical reactor.
- Examples of large-scale industrial processes.

Keywords

Bulter-Volmer model; Marcus model; rotating disk electrode; electrochemical reactor; fuel cells; mass transfer coefficient; electrosynthesis.

Learning Outcomes

By the end of the course, the student must be able to:

- Choose an electrocatalyst for a given electrochemical synthesis.
- Estimate the mass transfer coefficient and the limiting diffusion current
- Estimate the distribution of current and potential in an electrochemical reactor
- Choose the type of electrochemical reactor for a given production.
- Optimize an electrochemical process
- Optimize the current density for a galvanostatic operation.

Supervision

Assistants Yes

Resources

Notes/Handbook

Electrochemical Engineering (2012) ; Ch. Comninellis et G. Foti (notes)