UE Nano-pores and membranes technologies

Niveau d'étude
Bac +5

ECTS
3 crédits

Composante
UFR Physique, Ingénierie, Terre, Environnement, Mécanique (PhITEM)

Période de l'année
Automne (sept. à dec./janv.)

Diplômes intégrant cet élément

- Master Nanosciences et nanotechnologies

Langue(s) d'enseignement: Anglais

Ouvert aux étudiants en échange: Oui

Code d'export Apogée: PAX9NCAH

Présentation

Description

Goal: From the sequencing and electronic analysis of single molecules, to waste water treatment, desalinisation, or osmotic energy harvesting, , nanopores and membranes technologies are a rapidly growing area of nanosciences with increasing applications in the fields of sustainable energy, environment, and nanobiotechnologies. The aim of the course is to provide the theoretical concepts governing the transport of fluids, ions and molecules in nanochannels and confined spaces. It will highlight the new properties and functionnalities which arise from the interplay of surface interactions in solutions, flow and transport.

Content:

1. A general overview of nanopores and membrane technologies.
2. The basics of surface transport in fluids
   . Flow and diffusion at a nano-scale
   . Ions and molecule surface interactions in fluids
3. Coupled transport at surfaces and in nano-channels.
   Electro-osmosis, diffusio-osmosis and beyond

Informations non contractuelles.
Dernière mise à jour le 30 juin 2026

Weak out-of-equilibrium limit and Onsager relations
From nano properties to macroscopic efficiency
Example of application: energy harvesting/conversion

4. Non-linear and rectification effects.
Nano-fluidic diodes, osmotic diode, and transistor.
5. Nano-pores for single molecules transport and detection
6. Membranes for fuel cells.

Heures d'enseignement

CMTD	Cours magistral - Travaux dirigés	22,5h

Période : Semestre 9

Infos pratiques

Lieu(x) ville

Grenoble

Campus

Grenoble - Domaine universitaire

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