Introduction to transport phenomena

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Summary
This course aims at understanding the basic equations behind macroscopic and microscopic transport phenomena (mass, heat and momentum).

Content
• Conservation of energy, heat and momentum
• Macroscopic balances and advective transport
• Bernoulli’s equation
• Equations and parameters for microscopic transport: mass transport (Fick’s law), heat transport (Fourier’s law) and momentum transport (Newton’s law)
• Analogy between the three types of transfer
• Introduction to non-dimensional quantities
• Combined macroscopic and microscopic transfer applications (e.g. pipe flow with friction loss), heat exchangers.

Keywords
macroscopic balances, transport phenomena, flux equation

Learning Prerequisites
Required courses
Introduction to chemical engineering

Learning Outcomes
By the end of the course, the student must be able to:
• Identify heat transfer, mass transfer and momentum phenomena in lab, industrial and daily environment which are relevant both for chemists and chemical engineers
• Identify quantities and subjects used in transport phenomena
• Describe transport phenomena at the macroscopic and at the molecular level
• Recognize the similarities between the three transport phenomena
• Analyze problems involving transfer phenomena
• Use balance to solve problems
• Justify your approach to problem solving

Teaching methods
Lectures with exercises

Expected student activities
solution of exercises

Assessment methods
Two written tests during the semester

Resources

Bibliography

Ressources en bibliothèque
• Introductory transport phenomena / Bird