

# Chemical Kinetics/ Heterogenous Catalysis

1. **Course number and name:** 020CCHCS1 Chemical Kinetics/ Heterogenous Catalysis

2. **Credits and contact hours:** 2 ECTS credits, 1x1:15 contact hours

3. **Name of instructor:** Roger Lteif

4. **Instructional materials:**

- Catalyse de contact (conception, préparations et mise en œuvre des catalyseurs industriels), J.F. Le Page et coll. (TECNIP, 1978)
- Introduction à la cinétique hétérogène, B. Delmon (TECNIP, 1969)
- Cinétique hétérogène et catalyse, Scacchi Gérard, (Lavoisier 2011)
- The Theory of Adsorption and Catalysis. Physical Chemistry, A Series of Monographs, Von A. Clark (Academic Press, New York, London 1970)
- Principles of Adsorption and Reaction on Solid Surfaces, R.I. Masel (Wiley, New York, 1996)
- Analyse physico-chimique des catalyseurs industriels : manuel pratique de caractérisation, John Lynch (TECNIP, 2001)

5. **Specific course information**

a. **Catalog description:**

The basic concepts of kinetics and heterogeneous catalysis. The different stages of the catalytic reaction (diffusion, adsorption and surface reaction). The properties of solid catalysts. The main industrial and environmental applications of catalysts.

b. **Prerequisites:** 020CIHNI4 Kinetics of Chemical Reactions

c. **Required/ Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**

a. **Specific outcomes of instruction:**

- Understand the basic concepts of catalysis and heterogeneous kinetics
- Describe and select the different methods for the preparation of heterogeneous catalysts and their activation
- Analyze the different steps of the reaction mechanism of heterogeneous catalysis
- Describe the use of certain catalysts in different situations

b. **PIs addressed by the course:**

PI	1.1	1.2	1.3
<b>Covered</b>	x	x	x
<b>Assessed</b>	x	x	x

7. **Brief list of topics to be covered**

- Specificities of heterogeneous kinetics: thermodynamics and chemical kinetics.
- Adsorption and solid-gas reactions: rate of adsorption and desorption
- Germination and transformations by germination-growth.
- Diffusion and transformations by reaction-diffusion
- Adsorption, kinetics, mechanisms: Reaction stages of heterogeneous catalysis.
- Energetic aspects: physisorption vs chemisorption
- Adsorption isotherms. Langmuir isotherms. Brunauer, Emmett and Teller theory (BET)