

Heterogeneous Catalysis and Catalytic Processes - Video course

COURSE OUTLINE

More than 90% of all the chemical product formation processes are catalytic in nature and heterogeneous catalysis plays an enormous role.

Improving the catalyst effectiveness is the best way to ensure cleaner and efficient industrial processes.

This course examines the detailed structures, preparation methods and reactivity of various solid catalysts like zeolites, supported metals and metal-support interactions, carbon catalysts, monoliths and others.

The relationship between the structures and reactivity of important catalysts used in hydrocarbon conversion and treating processes will be examined to rationalize how they accomplish specific catalytic transformations.

The characterization process to understand the textural and chemical properties of the metal /support will be discussed along with reaction mechanism on a solid surface.

Microkinetic reaction mechanism will also be discussed for various catalytic reactions.

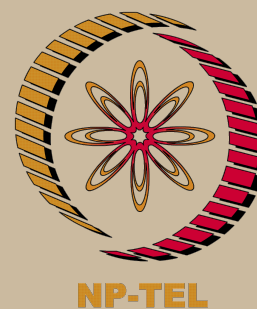
Contents

Basic concepts in heterogeneous catalysis and green chemistry, catalyst preparation and catalyst characterization, Surface reactivity and kinetics of reaction on surfaces, poisoning and regeneration.

Industrially important catalysts and processes such as oxidation, processing of petroleum and hydrocarbons, synthesis gas and related processes, Environmental catalysis, Commercial catalytic reactors (fixed bed, fluidized bed, trickle-bed, slurry, etc.).

Heat and mass transfer and its role in heterogeneous catalysis. Calculations of effective diffusivity and thermal conductivity of porous catalysts.

Reactor modeling. Emphasizes the chemistry and



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Chemical Engineering

Pre-requisites:

1. Chemical and catalytic Reaction Engineering.

Additional Reading:

1. B.W. Wojciechowski and N.M. Rice 'Experimental Methods in Kinetic studies'.
2. J. Regalbuto 'Catalyst Preparation: Science and engineering'.
3. B. Cornils, W.A. Herrmann, R. Schlögl, C.H. Wong Catalysis from A to Z.
4. Published articles from journals.

Coordinators:

Dr. K.K. Pant
Department of Chemical

engineering aspects of catalytic processes along with problems arising in industry. Catalyst deactivation kinetics and modeling.

COURSE DETAIL

S.No	Topics	No. of Lectures
1	Introduction and Basic concept of green catalysis.	2
2	Solid acids and bases as catalysts , Application of catalyst functionality concepts for control of reaction selectivity and kinetic models.	2
3	Kinetics and reaction on surfaces, Application of functionality concepts for control of reaction selectivity and microkinetic models.	4
4	Steps in catalytic reaction (Adsorption, Kinetic models, interparticulate and intraparticle transport process.	6
5	Selection and design and Preparation of catalysts.	3
6	Textural Properties of solid catalysts.	3
7	Characterization of catalysts.	2
8	Zeolite catalysts , preparation, characterization and applications.	2
9	Optimal distribution of catalyst in a pellet.	2

10	Environmental catalysis.	2
11	Commercial Catalytic Reactors (Adiabatic, fluidized bed, trickle bed , slurry etc.).	4
12	Industrially important catalysts and processes such as oxidation, processing of petroleum and hydrocarbons, synthesis gas and related process.	4
Total		40

References:

1. Catalytic Chemistry :Bruce Gates.
2. Chorkendorff, J.W Niemantsverdriet 'Concept of Modern Catalysis and Kinetics'.
3. R.A Sheldon, I.Arends, U. Hanefeld 'Green Chemistry and Catalysis'.
4. M.A. Vennices 'Kinetics of catalytic reactions'.