



# FKE3070 Catalyst Deactivation

## 5.0 credits

### Katalysatordeaktivering

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

### Establishment

Course syllabus for FKE3070 valid from Spring 2014

### Grading scale

### Education cycle

Third cycle

### Specific prerequisites

MSc in chemical engineering, chemistry or physics with a specialization in materials chemistry/material physics and/or catalysis.

### Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

### Intended learning outcomes

After approved course the PhD student should be able to

- discuss applications of catalysts in industrial catalytic processes
- evaluate deactivation mechanisms
- analyze sintering, coking and poisoning
- apply expressions for deactivation kinetics at design of catalytic reactors
- discuss the routes to carbon in various industrial processes
- relate evaluation of deactivation in laboratory scale to deactivation in industrial environments

## Course contents

Secondary phenomena and plant design, sintering (support, metal crystals), poisoning (chemisorption, Ni/H<sub>2</sub>S example, diffusion, dynamics, effectiveness factors), routes to carbon (FCC example, gum formation, coke from pyrolysis), carbon formation on metals (steam reforming), fouling of catalysts (interparticle (HDS example), intraparticle (flue gas catalysis),

process influence on catalyst deactivation (feed, fuel and impurities, industrial examples), process influence on catalyst deactivation (influence of ash, dust and mechanical problems, industrial examples), Catalyst deactivation studies (field vs. laboratory evaluations)  
Lectures and seminars are given by Prof. Jens Rostrup-Nielsen (former R&D Manager Haldor Topsøe).

## Course literature

Utdelade artiklar i ämnesområdet katalysatordeaktivering, t ex

C.H.Bartholomew, "Mechanisms of catalyst deactivation", Appl.Catal. A 212(2001) 17-60

G.F.Froment, "Modeling of catalyst deactivation", Appl.Catal. A 212(2001) 117-128

J.R.Rostrup-Nielsen, L.J.Christiansen, "Concepts in Syngas Manufacture"

Imperial College Press 2011) Chap.5

Hand-outs of relevant scientific papers concerning catalyst deactivation, t ex

C.H.Bartholomew, "Mechanisms of catalyst deactivation", Appl.Catal. A 212(2001) 17-60

G.F.Froment, "Modeling of catalyst deactivation", Appl.Catal. A 212(2001) 117-128

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## Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Mandatory active participation in more than 80 % of seminars and lectures. Approved written examination, oral presentation and home assignments.

## **Ethical approach**

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.