

**Facultatea DE CHIMIE**

**Departamentul DE CHIMIE ORGANICĂ, BIOCHIMIE SI CATALIZĂ**

**PROFESOR UNIVERSITAR, poziția 26**

### **Discipline din planul de învățământ**

1. *Tehnologie chimică; curs*
2. *Materiale catalitice / Catalytic materials. curs*

#### **Tematica si bibliografie**

##### **1. Tehnologie chimică**

Clasificarea proceselor tehnologice. Calculul performantei proceselor chimice: conversie, selectivitate, randament, randament real, randament la echilibru, capacitate de productie, intensitatea operatiei, productivitate. Bilant de materiale. Calculul bilantului de materiale in procese chimice: general, pe specii moleculare, pe specii atomice si pe baza gradului de avansare a reactiei. Bilant de energie. Calculul bilantului de energie in procese chimice prin metoda cadurii de reactie si metoda caldurii de formare. Reactoare chimice ideale. Reactoare continue: reactorul cu curgere piston, reactorul cu amestecare perfecta si cascada de reactoare cu amestecare perfecta. Reactorul discontinuu. Echilibrul chimic în procese tehnologice. Efectul variabilelor regimului tehnologic asupra echilibrului chimic. Calculul gradului de conversie la echilibru pentru diferite tipuri de procese industriale. Echilibre in procese tehnologice reale. Cazul proceselor cu echilibre multiple. Calculul constantei de echilibru si a conversiei la echilibru din date termodinamice. Intensificarea proceselor tehnologice. Metode de crestere a fortei motrice, a constantei de viteza si a interfetei de contact. Materii prime si surse de energie pentru industria chimica. Tehnologii catalitice in rafinarea petrolului. Tehnologia amoniacului.

*R.M. Felder, R.W. Rousseau, Elementary principles of chemical processes, John Wiley & Sons, New York, 2005.*

*S.J.R. Simons, Concepts of Chemical Engineering 4 Chemists, RSC Publishing, Cambridge, 2007.*

*I.P. Mukhlyonov, Fundamentals of Chemical Technology, Mir Publishers, Moscow, 1986.*

*C.G. Hill, An Introduction to Chemical Engineering Kinetics & Reactor Design, John Wiley & Sons, New York, 1977.*

*J.M. Smith, H.C. Van Ness, M.M. Abbott, Introduction to chemical engineering thermodynamics, McGraw-Hill, Boston, 2001.*

*A. Urdă, E. Angelescu, I. Săndulescu, Chimie Tehnologică Generală, partea I, Editura Universității din București, 2005.*

*J.G. Speight, The Chemistry and Technology of Petroleum, Taylor & Francis Group, Boca Raton, 2006*

## 2. *Materiale catalitice / Catalytic materials*

Fundamental properties and classification of catalytic materials. Catalytic materials based on metals and metallic alloys. Specific features regarding the structure and properties of metallic catalysts. Preparation of bulk and supported metal catalysts. The nature of the active sites. Structure sensitivity. Supported metal catalysts. Metal-support interaction. Reaction mechanisms in catalysis on metals. Oxide-based catalytic materials. Preparation techniques. Structure of oxide catalysts. Oxides with variable valence state. Oxide non-stoichiometry – structural defects. Their semiconductor character and consequences for catalysis. Catalytic oxidation. The Mars – van Krevelen reaction mechanism. Acidic oxides. Origin of acidity. Lewis and Brønsted acidity in oxides. Control of acidity. Alumina – catalyst and support. Base oxides. Layered double hydroxydes – precursors for base oxides. Synthesis. Structure. Memory effect. Origin of basicity. Applications in catalysis.

*J.M. Thomas, W.J. Thomas, Principles and Practice of Heterogeneous Catalysis, Wiley, 1996.*

*J.A. Anderson, M. Fernandez Garcia (Eds.), Supported Metals in Catalysis, Imperial College Press, 2005.*

*J.L.G. Fierro (Ed.), Metal Oxides - Chemistry and Applications, CRC Press, 2006.*

*K. Kosuge, Chemistry of non-stoichiometric compounds, Oxford University Press, 2001.*

*J.M. Herrmann, Les techniques physiques d'étude des catalyseurs (Imelik, B., Védrine, J.C. – éditeurs), Ed. Technip, Paris, 1988, Ch. 22.*

*S.M. Coman, V.I. Pârvulescu, Cataliză Acido-Bazică, Editura Academiei Române, București, 2010.*

*F. Cavani, F. Trifiro, A. Vaccari, Hydrotalcite-type anionic clays: preparation, properties and applications, Catalysis Today, 11 (1991) 173-301.*

*D.G. Evans, X. Duan (Eds.), Layered Double Hydroxides, Springer-Verlag Berlin, 2006.*

*G. Ertl, H. Knözinger, F. Schüth, J. Weitkamp (Eds.), Handbook of Heterogeneous Catalysis, 2nd Edition, Wiley-VCH, Weinheim, 2008.*

*F. Schüth, K. S. W. Sing, J. Weitkamp, (Eds.), Handbook of Porous Solids, Wiley-VCH, Weinheim, 2002.*