UNIVERSITY OF MISKOLC
Faculty of Materials Science and Engineering

Antal Kerpely Doctoral School of Materials Science and Technology

Chemical Metallurgy-I

Dr. Tamás I. Török

COURSE DESCRIPTION

2016.

Chemical Metallurgy-I

Dr. Tamás I. Török

Teacher

Dr. Tamás I. Török, Professor, Institute of Metallurgy

Room: B1 3rd floor, 302. mail: fektt@uni-miskolc.hu, TEL: +36 46 565 111 Ext.: 1514 , http://www.metont.uni-miskolc.hu.

Subject offered

To the students interested in metals technologies (metals extraction, casting metallurgy etc.)

Language

Hungarian or English

Main goals

It is aimed at deepening the knowledge of the PhD students in the principles of metals technologies including the fields of corrosion and surface engineering.

Capabilities to be acquired

The students should gain fresh knowledge of applied chemistry and metallurgy related to the properties of metals and alloys including their production, processing and surface finishing. After completing the course the students should be better prepared to design and control metallurgical and surface engineering processes. The acquired knowledge may help anyone's successful progress in his/her further studies interested in chemical metallurgy.

Methodology

The students will be given lecture notes, scientific papers and other teaching materials to help and facilitate their studies, plus regular consultations will also be offered and arranged to discuss the contents of the subject. At least one pesentation is also requested from each student about a specific chemical metallurgy topic most closely related to his/her doctoral research theme.

Syllabus

Characterization of metals and their most important alloys based on the interpretation of bonding mechanisms.

Thermodynamic fundamentals and interpretation of the oxidation and reduction processes of metals and compounds of metals, respectively. Using of thermochemical databases (e.g. the HSC Software) to describe principles of metallurgical processes.

Fundamental transport properties and kinetics in metallurgical processes (heterogeneous reaction systems).

Corrosion of metals and alloys; description and classification of corrosion processes. Classes of electrochemical corrosion systems. Applicability of the Pourbaix diagrams for the interpretation of aqueous corrosion processes.

Specialities of the separation unit processes used in the fields of metallurgy; basic production methods of specific alloys used from the extraction stages to the surface finishing techniques of metal products (survey and classification).

Relevant literature

1. Moore, J.J.: Chemical Metallurgy, Butterworth, London-Boston, 1981.
2. Fashi Habashi: Principles of Extractive Metallurgy Volume 1 General Principles, Gordon & Breach, New York-London-Paris
3. Fathi Habashi: Metallurgical Chemistry, American Chemical Society, Washington, D.C., ACS Audio Course Lecture Notes

+ If necessary, the students are offered specific lecture notes and scientific papers related to his/her research theme.

Final exam

Oral presentation of a study report and oral questioning/discussion at the final exam.

Complex questions

1. Specificities of metallic bonding in comparison to the other types of chemical bonds.
2. Thermodynamic equilibrium diagrams (e.g. that of the so-called Ellingham ones) together with their applicability in metallurgical systems.
3. Description of the role of metallurgical factors like, for example, the chemical oxidation-reduction reactions coupled with transport processes in the materials transformation process kinetics.
4. Description and characterization of the corrosion (materials degradation) processes together with their typical mechanisms.
5. Review (description) of a given modern metals (metallurgical) technology via characterising all the major extraction, processing and surface finishing steps.