

Structural materials

Ceramics and powders

IDENTIFICATION

CODE : SGM-4-S2-CERA
ECTS : 1.0

HOURS

Lectures : 20.0 h
Seminars : 0.0 h
Laboratory : 0.0 h
Project : 0.0 h
Teacher-student
contact : 20.0 h
Personal work : 20.0 h
Total : 40.0 h

ASSESSMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

Know the main class of ceramic materials and their specific characteristics. To be able, on a general point of view, to identify composition, structure and microstructure which fits the properties required for an application. Have the skills to apply general principles of divided materials processing to typical ceramic elaboration cases.
Basic formation on ceramic science and powder technology

CONTENT

First part.

Definition and classes of ceramics. Description of the links between the atomic bonds, structures, typical microstructures, and the main properties and applications (mechanical, functionals, traditional, construction, ...). General principles of fabrication of the various classes of ceramics.

Second part. Ceramic and divided materials processing. Surfaces and interfaces thermodynamics, surface forces, mineral powders synthesis, divided materials characterization, solid state sintering, liquid phase sintering, basic sintering models, powders flow, packing and compaction, Pastes and suspensions rheology, description of the mineral-solution interface, electrochemistry of suspensions, basics of process science.

BIBLIOGRAPHY

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- Traité des Matériaux, Presses Polytechniques et Universitaires Romandes, 1999-
- A.J. Moulson, J.M. Herbert, Electroceramics, Chapman et al., 1993
- J.S. Reed, Principles of ceramics processing, Wiley inter-science, 1994
- T. Allen, Powder sampling and particle size determination, Elsevier, 2003
- R. M. German, Particle packing characteristics, Metal Powder Industries Federation, 1989
- W. D. Kingery, H. K. Bowen, D. R. Uhlmann, Introduction to ceramics, 1976
- D. Bernache-Assollant, Chimie-physique du frittage, Hermes, 1993
- J.P. Jolivet, De la solution à l'oxyde, EDP Sciences Editions, 1994
- Gouttes, bulles, perles et ondes, P-G de Gennes, F. Brochard-Wyart, D. Quéré, Belin, 2002

PRE-REQUISITE

Basic knowledge in material science