Ceramics Technology

Academic Year: (2023 / 2024) **Review date: 21/07/2020 17:06:54**

Department assigned to the subject:

Coordinating teacher: VAREZ ALVAREZ, ALEJANDRO

Type: Electives ECTS Credits : 6.0

Year : Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Materials Science and Engineering

OBJECTIVES

Ability to solve problems related to the Science and Technology of Ceramic Materials.
- Ability to research, understand and differentiate the relevant information in order to make a decision in the field of science and engineering ceramics.
- Ability to use multidisciplinary knowledge to solve a problem related to the ceramic industry.
- Ability to understand the relationship between structure, microstructure and properties of ceramic materials and their interaction with the processing thereof.
- Ability to work in groups and distribute work on problems related to the ceramic industry.
- Ability to extrapolate the concepts of ceramic technology to other engineering disciplines.

DESCRIPTION OF CONTENTS: PROGRAMME

1: Fundamentals of Ceramic Materials
1.1 Introduction to ceramic materials
1.2.-Structure and defects of ceramic materials
1.3.-Phase diagrams of ceramic materials
1.4.-Properties of ceramic
1.5.-Manufacturing of ceramics

2: Silica and Glasses
2.1.-Silica
2.2.-Silicates
2.3.-Glasses
2.4.-Manufacturing of glasses

3: Traditional Ceramics
3.1.-Clay and their products
3.2.-forming techniques
3.3.-Refractory: Refractory types and applications

4: High Performance Ceramics
4.1.-Structural Ceramics:
- 4.1.1. - Alumina
- 4.1.2. - Zirconia
- 4.1.3.-silicon nitride and sialon
- 4.1.4. - Silicon carbide
- 4.1.5. - Diamond and graphite.

4.2.-Functional Ceramics:
- 4.2.1. - Dielectric and ionic conductors
- 4.2.2. - Ceramic superconductors
- 4.2.3. - Magnetic ceramics.
- 4.2.4. - Ferroelectric and piezoelectric ceramics

LEARNING ACTIVITIES AND METHODOLOGY

Master classes, classes to solve doubts in reduced groups, student presentations, individual tutorship and personal work of the student; oriented to acquire theoretical knowledge.

Laboratory classes, classes for solving problems in reduced groups; individual tutorship and personal work of the student; oriented to acquire practical knowledge related to subject program.
There will be five practices related to the synthesis of a ceramic powder. After verification of powder is single-phase, by means of XRD and SEM analysis, it will be conformed and sintered. Afterward transport properties will be evaluated..

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

The evaluation will be composed of a final written exam (worths 60% of the final mark) and a continuous evaluation. It is mandatory to achieve a minimum mark of 4/10 in the final written exam. Besides, laboratory practices are mandatory for being assessed.

The continuous evaluation will have two parts:

(i) Test and Exercises: Individual tests, and exercises, during the course, besides a and the performance and presentation of group work. This will have a final assessment of 30%
(ii) Laboratory: Three laboratory practices, solving a questionnaire or test at the beginning of the first lab session regarding to the laboratory instructions (to assess the prior preparation from the student). In addition, a final report and a final test, regarding lab practices, will be evaluated. Laboratory mark worths 10%.

BASIC BIBLIOGRAPHY

- A.R. West Solid State Chemistry and Its Applications, John Wiley & Sons, 1992

- C. Barry Carter, M. Grant Norton Ceramic Materials: Science and Engineering, Springer Science & Business Media, 2007

- M. Barsoum Fundamentals of Ceramics, International Editions, McGraw-Hill, 1997

- W.D. Kingery; H.K. Bowen and D.R. Uhlman Introduction to Ceramics, John Wiley & Sons , 1976

- W.E. Lee and W. M. Rainforht Ceramic Microstructures, Chapman & Hall, 1994

ADDITIONAL BIBLIOGRAPHY

- J.M. Fernández Navarro El Vidrio, CSIC - Fundación Centro Nacional del Vidrio, 1991

- M.A. Alario Franco y J.L. Vicent Superconductividad, Eudema Universidad, 1991

- M.A. Alario Franco y J.L. Vicent Superconductividad, Eudema Universidad, 1991

- N. Brathwaite y G. Weaner Electronic Material, Ed. Butterworths., 1990

BASIC ELECTRONIC RESOURCES

- Alejandro Várez, Eugenia Rabanal, Belen Levenfeld, M Eugenia Sotomayor . Ceramicas y Vidrios (Open Course Ware): http://ocw.uc3m.es/ciencia-e-oin/ceramicas-y-vidrios