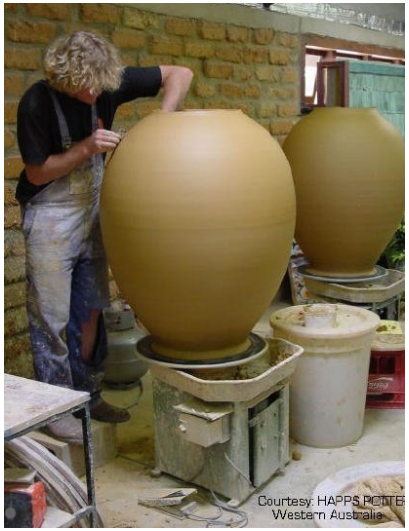
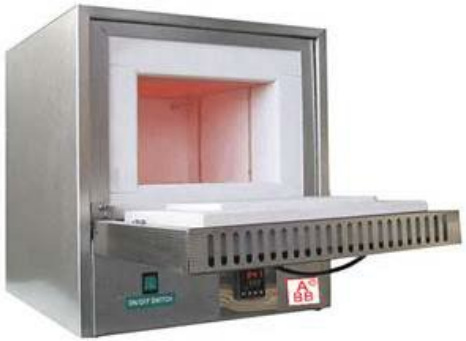
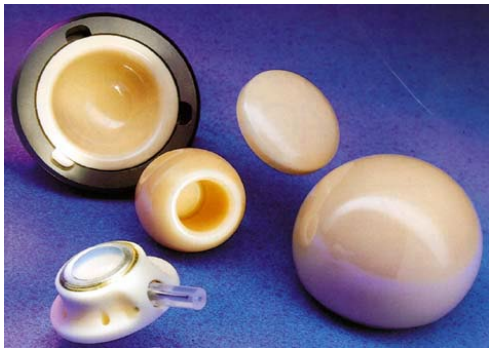
Ceramic and Colloidal Processing

Course Organisation

Andrea Testino







hip prosthesis

Ceramic and Colloidal Processing MSE-326

3rd year- semester 5 – MSE-326 will be given in ENGLISH

Room: MXG 110

Course and exercises

- Ceramic and Colloidal Processing (A. Testino) - 3 credits
- Tuesdays 9h15-12h00 – 2hrs course – 1hr exercises/discussion
- Lectures *ex cathedra* (in presence)
- Lectures and exercises in pdf format to be found on Moodle for each week. They will be posted (updated) the Monday before course (at the latest).

Guests & Exercises

- Insight on topics and specific applications
- Exercises available for every topic

Supporting Material

- Course mainly based on French book
- **Les Céramiques,** J. Barton, P. Bowen, C. Carry & J.M. Haussonne, Les Traité des Matériaux, Volume 16, PPUR, 2005 (5 books available EPFL library)
- But with accompanying books in English that cover all sections

English Books:

1. **Ceramic Processing and Sintering** - M. N. Rahaman Taylor & Francis, London, 2003 (available as e-book EPFL library)
2. **Fundamentals of Ceramic Powder Processing and Synthesis**, T.A. Ring – Academic Press, 1996 (available as e-book EPFL library)
3. **Principles of Ceramic Processing**, JSReed , Wiley, 1995 (available as e-book EPFL library)
4. **The Colloidal Domain** – DF Evans & H. Wennerström, Wiley, 1999. (5 books available EPFL library)

Slides categories

1. Each slide belongs to a category: **1** **2** **3**

1 Fundamental concept: must be clearly understood.

2 Insights that are fundamental to understand and clarify previous level.

3 Additional information which may contain details, equations, tables, examples which help to understand and compare.

Teaching and evaluation

2. Teaching method: ex-cathedra but

A. All slides available in advance: You will have time to read them and address questions during the third hour if something is still not clear. It is not flip-class method, a kind of hybrid;
B. Attending the class is highly recommended;
C. You may formulate questions on the topic of that day. Questions and discussion will be assessed providing "+" to students.

3. Final evaluation

A. At the oral exam, you will be asked to start with a topic of your choice;
B. Your understanding of concepts among the diverse categories will define your final overall grade. If concepts under category 1 are not clear, the exam has high probability to fail;
C. Your active participation during classes will be part of the final evaluation (example: +++ = 0.50, ++ = 0.25).

Exam

- Oral in January exam session
- 15 min
- No preparation, No notes etc.
- More information later. Mid-term test – where questions will be asked to the whole class and not individual students – the mid-term test will inform students of the typical method and typical questions asked
- The mid-term test will not be graded.
- Active participation during classes
- Final grade for MSE-326 (3 credits).

Date/ Time	Title
9 Sept 9.15-12.00 week 1	1.Introduction - ceramics et colloids- applications and examples
16 Sept 9.15-12.00 week 2	2. Powder Characterization physical, chemical and morphology
23 Sept 9.15-12.00 week 3	3. Raw materials and powder synthesis – solid-solid, solid -gas
30 Sept 9.15-12.00 week 4	4. Powder synthesis, precipitation
7 Oct 9.15-12.00 week 5	**Guest**: Dr. Matteo Donati (PSI & Medicoat AG) Hydrophobic, Hydrophilic ceramic surfaces
14 Oct 9.15-12.00 week 6	5. Powder synthesis -gas phase et thermodynamics of solutions. 6. Powder Treatment (1) Milling and classification.
28 Oct 9.15-12.00 week 7	7. Powder Treatment (2)- Dispersion and wetting, van der Waals forces

Date/ Time	Title
4 nov 9.15-12.00 week 8	8.: Interaction between charged surfaces -electrostatic repulsion - Colloidal stability : le DLVO model – aggregation kinetics –
11 nov 9.15-12.00 week 9	9. Polymers in solution: solubility, conformation, adsorption at interfaces, Steric stabilization. Surfactants and micelles - colloids
18 nov 9.15-12.00 week 10	10. Powder Treatment (3) Rheology, mixing and granulation
25 nov 9.15-12.00 week 11	11. Ceramic forming methods dry pressing, tape casting, slip casting, drying and binder removal (burnout)
2 dec 9.15-12.00 week 12	12. Sintering: origin and phenomenology, kinetics and stages of sintering
9 dec 9.15-12.00 week 13	13. Control of microstructures. Liquid phase sintering. Sintering technology.
16 dec 9.15-12.00 week 14	14. Thin films and coatings