# ARCHAEOMATERIAL CHEMISTRY

CHIM/03 - 9 CFU - 2° semestre

**Docente titolare dell'insegnamento**

**ENRICO CILIBERTO**
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**Orario ricevimento:** lunedì-venerdì 11-12

## OBIETTIVI FORMATIVI

Knowledge of the most important materials used in archaeological and artistic artefacts

## MODALITÀ DI SVOLGIMENTO DELL'INSEGNAMENTO

In room lectures and laboratory experiences. In case of development of COVID infection some lectures could be given online in order to guarantee the holding of the course syllabus

## PREREQUISITI RICHIESTI

Inorganic and Organic Chemistry. Physics. Physical Chemistry

## FREQUENZA LEZIONI

mandatory attendance

## CONTENUTI DEL CORSO

Ceramics: definition and history. Fillosilicates and natural clays. Technologies of mixing and shaping throughout history. Technologies of furnace processes and related chemical reactions. Equivalent temperature of firing, the Maggetti’s model. Determination of the equivalent temperature of firing. Stoneware and porcelain. Decoration of the pottery, Egyptian faiences, Attic vases, majolica. Pottery degradation. Pottery dating.

Glasses: ores and technologies of glasses. Former oxides, modifiers oxides, chromatic elements and particles. Glass degradation: devitrification, leaching and corrosion.

Metal and alloys: a short history of their uses. Copper and copper alloys: bronze, phase diagram copper-tin; the roles of tin, lead and arsenic; the bronze disease. Brass and the role of zinc. Iron and steel, ores and early technologies. Iron corrosion. Lead and its uses, the lead pest. Lead isotopes and origins of the ores. Gold, silver and their alloys.

Lithic and pseudolithic materials. An overview of the most important natural rocks used in the historic architecture. Mortars and concretes: lime, technologies and hardening process. Hydraulic limes: technologies and uses. Gypsum and plaster. Concretes and problems of deterioration in modern buildings.

Paint materials and painting techniques. The colour of the materials. Pigments and dyes. Different binders in different painting techniques: fresco, tempera and oil. Interactions and compatibility between pigments and binders. Varnishes and their uses. Degradations of paint layers. Gilding techniques.

The Organic Materials: Papyruses, papers and parchments: chemistry of the raw materials; analytical and microscopic methods in order to identify them. Ambers: different origins and related methods of investigation. Mummies and mummification techniques. Embalming and petrification of human bodies.

Wood and its deterioration. Dating of biological samples by $^{14}$C.

Laboratory:

Synthesis of different pigments and their characterisation by SEM/EDX, FTIR, XRD: red lakes, Egyptian blue, Prussian blue.

Synthesis and characterisation of a coloured glass sample.

Paint layer cross sections and characterisation by OM and SEM/EDX

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## TESTI DI RIFERIMENTO

-Mark Pollard and Carl Heron, *Archaeological Chemistry*. The Royal Society of Chemistry (2008), ISBN 978-0-85404-262-3.

- K.J. Rao, *Structural Chemistry of Glasses*, Elsevier, 2002, ISBN 0080439586.

-P.T. Nicholson and I. Shaw, *Ancient Egyptian Materials and Technology*, Cambridge University Press, 2006, ISBN 0521452570

- M.J. Aitken, *Science-based Dating in Archaeology*, Longman Archaeology Series, ISBN 0582054982.

- W.S. Taft, J.W. Mayer, *The Science of Paintings,* Springer-Verlag ISBN 0387987223

## ALTRO MATERIALE DIDATTICO

The lectures and related ppt files are saved in the Teams directory. Many reviews and papers related to case studies are saved in the same area.

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## PROGRAMMAZIONE DEL CORSO

| | Argomenti | Riferimenti testi |
|---|---|---|
| 1 | Ceramic , lime and glasses | Mark Pollard and Carl Heron, Archaeological Chemistry. The Royal Society of Chemistry (2008), ISBN 978-0-85404-262-3. |
| 2 | Paintings | W.S. Taft, J.W. Mayer, The Science of Paintings, Springer-Verlag ISBN 038798722 |
| 3 | Dating | M.J. Aitken, Science-based Dating in Archaeology, Longman Archaeology Series, ISBN 0582054982. |
| 4 | Organic materials | P.T. Nicholson and I. Shaw, Ancient Egyptian Materials and Technology, Cambridge University Press, 2006, ISBN 0521452570 |

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## VERIFICA DELL'APPRENDIMENTO

### MODALITÀ DI VERIFICA DELL'APPRENDIMENTO

laboratory reports and oral exams. In case of development of the COVID infection, the exams could be given online

### ESEMPI DI DOMANDE E/O ESERCIZI FREQUENTI

The student must be able to answer questions related to the course program. Particular case studies, chosen by the student, are welcome.

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