

## Training Course

# Oxygen consumption measurements in conservation « Training in English »

**04-06.12.2024**

## Trainer

**Henning Matthiesen**, senior Researcher, PhD, Honorary Professor Environmental archaeology, and materials science

Educated as a chemist, he has 22 years working experience as a researcher at the National Museum of Denmark, and since 2020 he has been affiliated to the Royal Danish Academy – Conservation as honorary professor. His research focuses on environmental monitoring and preservation of cultural heritage, with special emphasis on the in-situ preservation of archaeological sites. Also, research into the development of new, non-destructive methods for monitoring and quantification of real time decay of cultural heritage objects under varying climate conditions. He has used oxygen consumption measurements intensively for the last 15 years for quantifying decay rates of both metals, wood, and various organic materials.

## The course in brief

Oxygen is a key factor in the degradation of materials and artefacts in museums, and for objects preserved in situ. Quantification of oxygen consumption may be used to estimate the rate of oxidation processes which is very relevant in conservation. One of its advantages is a high sensitivity allowing measurement of changes to real objects in real time under realistic environmental conditions, reducing the need for accelerated ageing experiments. The method is non-destructive allowing repeated measurements on the same object for instance before and after conservation to document the effect. With the introduction of optical sensors a few decades ago oxygen measurements have become easier and more versatile, and they have already been used to quantify degradation of archaeological and historical metals, bone, wood, amber, and other organic materials.

All participants should bring a PC with Excel installed. Participants may bring own samples that can be used for experiments.

## Objective

After the course the participants will have a better understanding of the possibilities and practical aspects of oxygen consumption measurements in conservation research and in daily conservation. They will be able to carry out measurements on their own and to make the necessary data analysis. They will be introduced to different types of equipment and setups, their advantages and disadvantages, and costs. The participants will learn about the theory behind oxygen consumption measurements and get various practical tips and tricks that improve the measurements. The workshop includes practical demonstrations, hands on experiments, and exercises with data treatment.

## Target audience

Conservators or preventive conservation professionals of archaeological and historical metals, bone, wood, amber, and other organic materials.

Heritage scientists or any other field with an interest in measuring oxygen consumption.

## Course

### Day 1 (welcome 8.30 / lesson 9.00-17.30)

- Name-round and interest in oxygen consumption
- Principle behind oxygen consumption measurements
- Real-time demonstration of its use (using fast-corroding steel wool)
- Examples of use with different materials (including metals, wood, bone, ...)
- Determination of volume (hands-on)
- Hands-on experiment with own (wet) samples – runs until day 3 (all participants)
- Calculations theory for fixed volume
- Calculation exercises with data example

### Day 2 (8.30-17.00)

- Speeding up measurements for dry samples
- Use of flexible Escal bags
- Determination of volume (hands on)
- Calculations theory for flexible volume, including normalization of data
- Calculation exercise with data example
- Hands-on experiment with own sample – runs until day 3
- Interpretation of oxygen consumption for different materials

### Day 3 (8.30-17.00)

- Download of data from own samples
- Calculation exercises with own data
- Presentation and discussion of results
- Optimizing measurements
- Calibration of equipment
- Other uses of oxygen measurements (examples)

## Cost

CHF 750.-

Meals and travel expenses are not included.

## Contact

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