Cork structural characteristics and their influence on the oxygen ingress through wine stoppers

Vanda Oliveira and Helena Pereira

**Objective**

Contribute to the natural cork stoppers valorisation by developing an integrative quality classification based on visual quality and oxygen transfer performance.

**Oxygen ingress measurements**

**COLORIMETRIC METHOD** using the oxidation of an indigo carmine solution (Lopes et al. 2005)

1. **Calibration procedure**: reduction of indigo carmine in the bottle and bottle-controlled oxidation of reduced indigo carmine by injection of microquantities atmospheric oxygen.

2. **Bottling procedure and storage**: reduction of indigo carmine in commercial bottles and the sealing procedure of the natural cork stoppers.

3. **Colorimetric measurements during time**

**Kinetics of oxygen ingress into bottle**

**X-ray μ-Tomography**

![X-ray μ-Tomography Diagram]

**Cork stoppers internal structure**

- Thicker planks
- Larger growth rings
- More earlycork cells
- With bigger lumens
- Higher oxygen ingress

**Internal discontinuities**

Lenticular channels study

3D model of cork stoppers internal structure

The void fraction of lenticular channels in the innermost part of the cork stopper inserted in the bottle was strongly related to the oxygen ingress in the first month after bottling.

After a first period, gas transport occurs with very low diffusion rates and is related to air trapped inside the cellular structure.