



Oxidation Management of White Wines

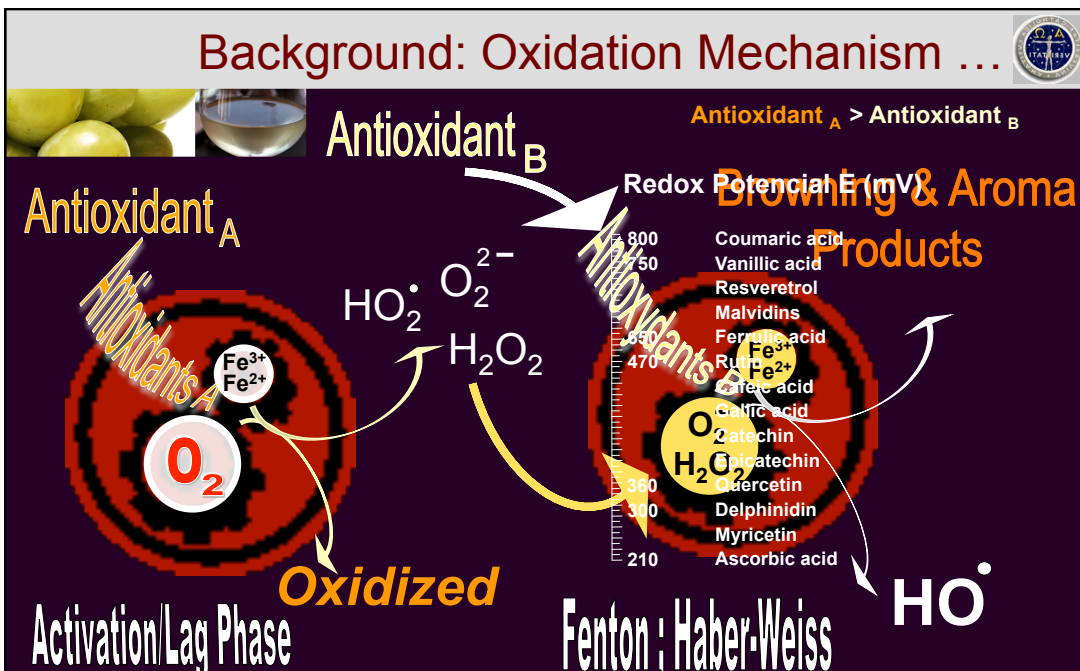
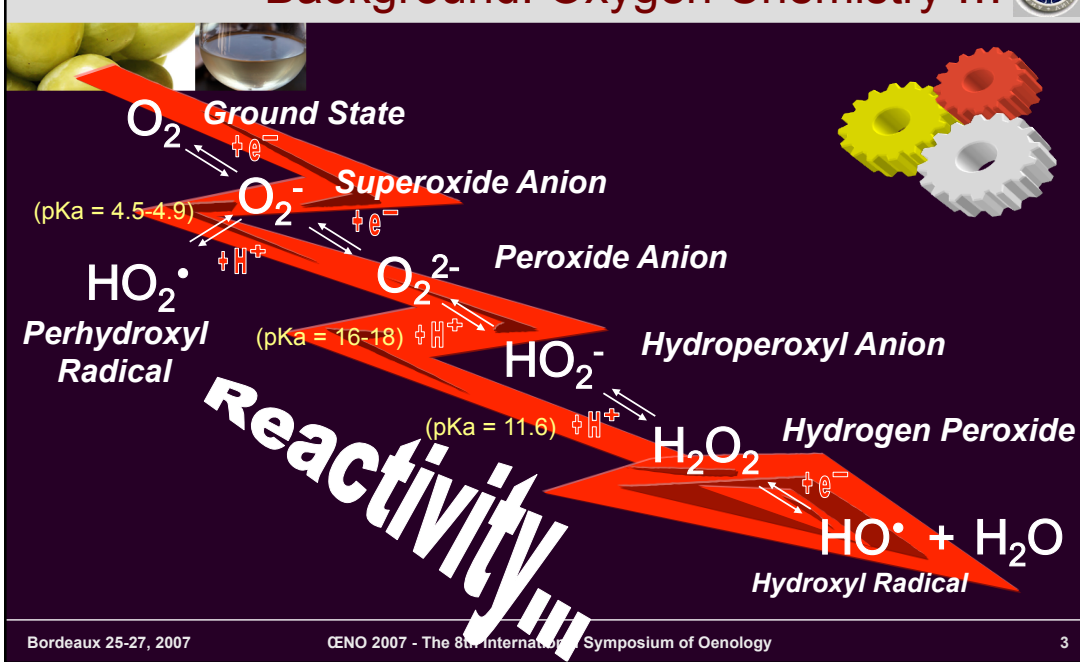
A. C. Silva Ferreira, R. Martins, V. Lopes, A. Rodrigues, F. Bento, D. Geraldo, A. Silva, C. Oliveira, P. Guedes Pinho

A. C. Silva Ferreira*, A. Rodrigues, F. Bento, D. Geraldo, A. Silva, C. Oliveira, P. Guedes Pinho
Universidade Católica Portuguesa, Porto, PORTUGAL

Objectives

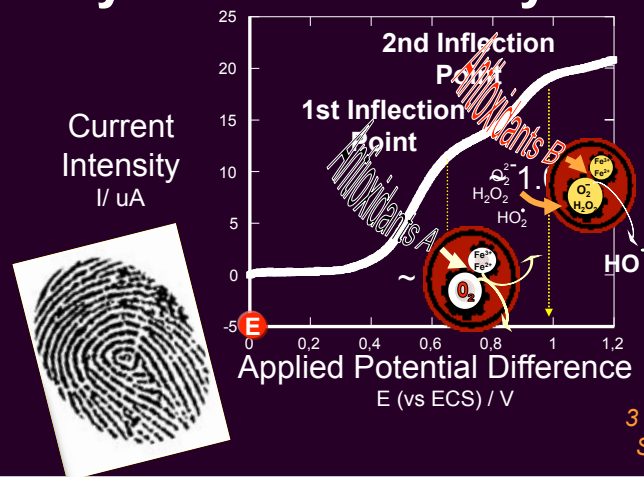


- **Oxygen/Antioxidant :**
- Mechanisms of consumption
- **“Resistance to Oxidation” :**
- Shelf-Life Control
- **Random & Sporadic Oxidation :**
- Cork Stopper





Cyclic Voltammetry



Redox Potential E (mV)

800	Coumaric acid
750	Vanillic acid
	Resveretrol
	Malvidins
650	Ferrulic acid
470	Rutin
	Cafeic acid
	Gallic acid
	Catechin
	Epicatechin
360	Quercetin
300	Delphinidin
	Myricetin
210	Ascorbic acid

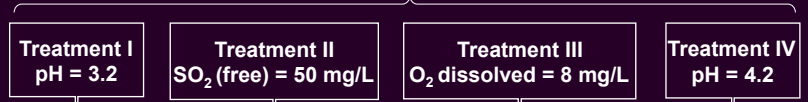
3 mm diameter glass carbon electrode
Scan Range: 100 mV / sec (diffusion)

Experimental Design : Sample Preparation



• Forced Aging Protocol

- Group I -
pH= 3.2 ; [SO₂]_{free} = 12 mg/L ; [O₂] = 1.0 mg/L



Stored @ T = 15 °C ; @ T = 40 °C ; @ T = 60 °C

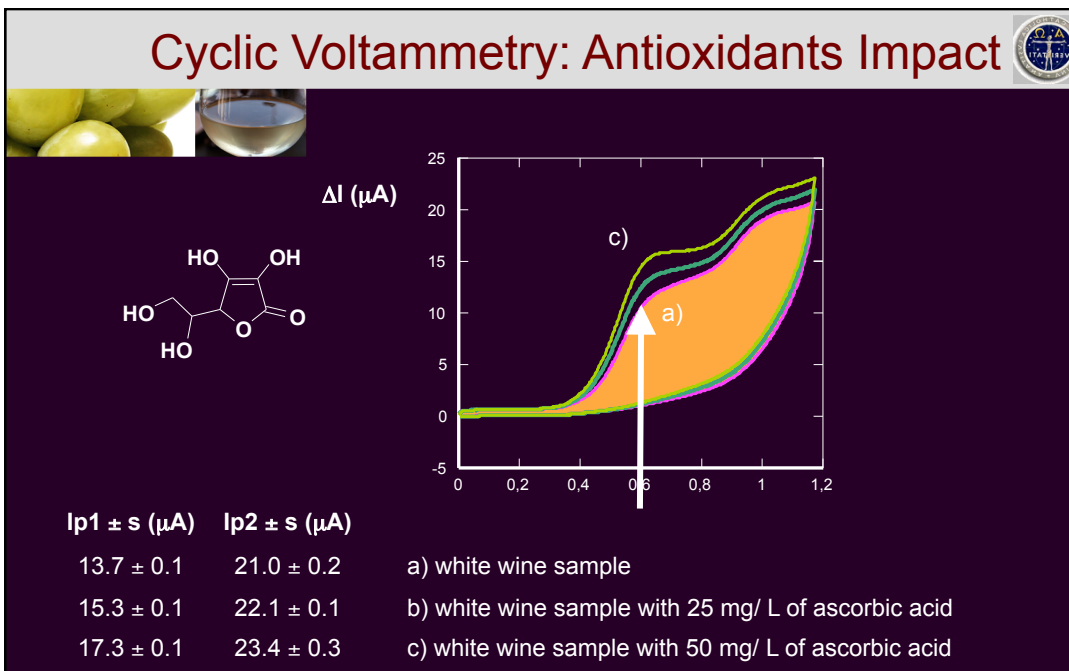
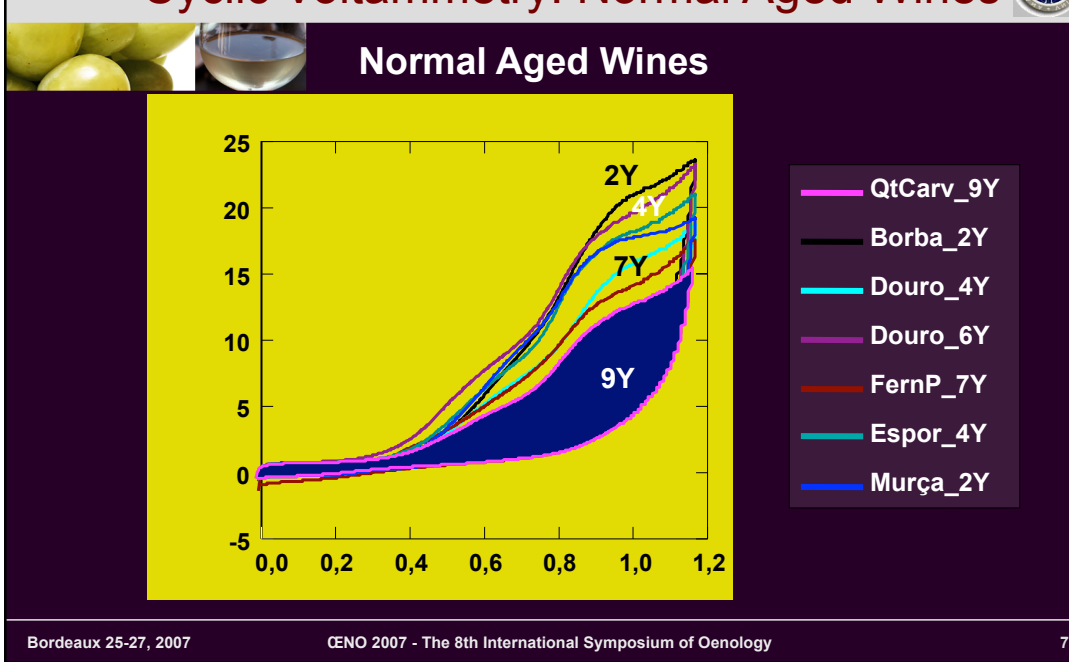
Sensory and Chemical analysis

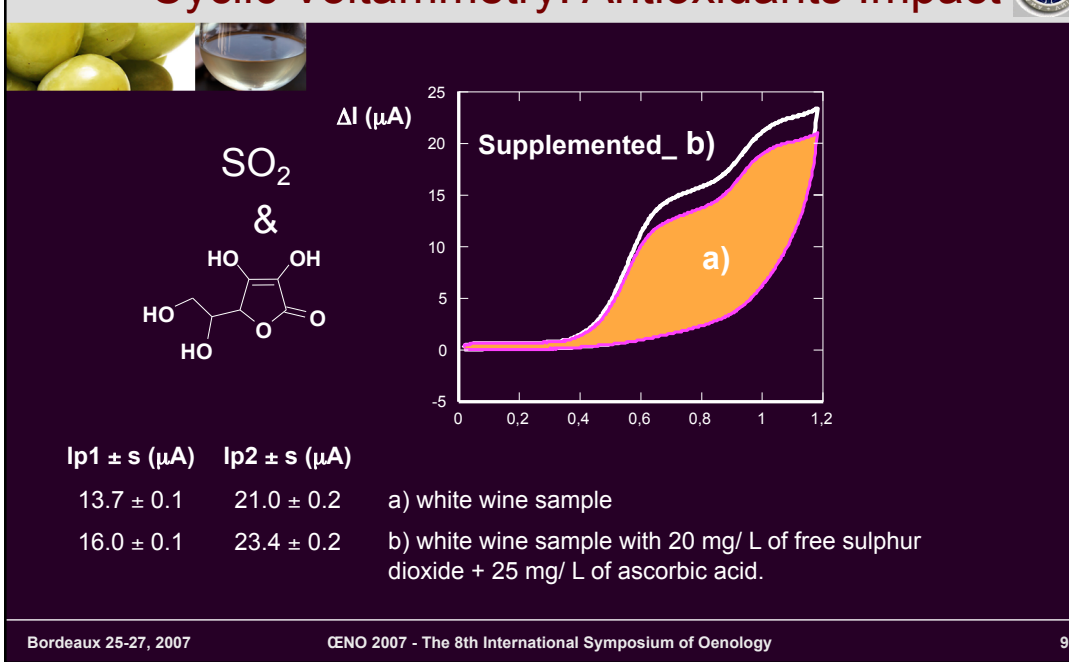
• Normal Aged

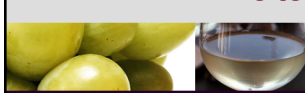
Different Vintages (n=24) Age 1-20 years Old
- Group II -

• Cork Stopper Oxygen Permeability: Storage Position

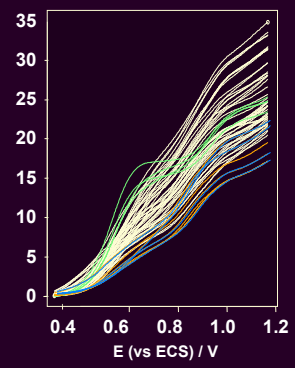






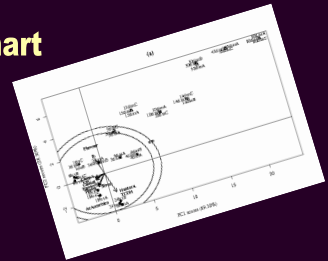


Raw Voltammetry



All data points
=
Quantitative and Qualitative Information

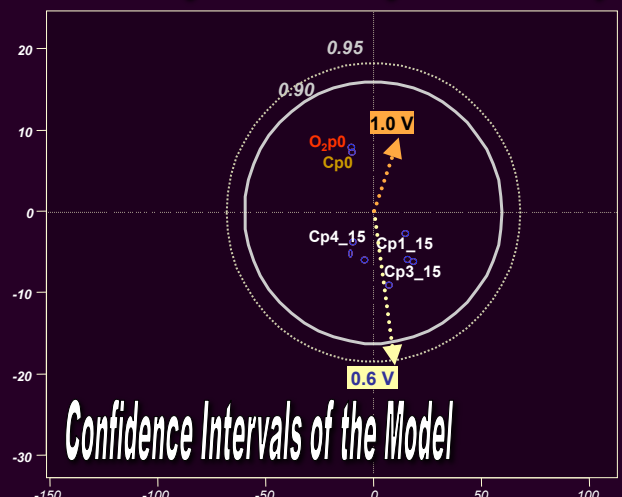
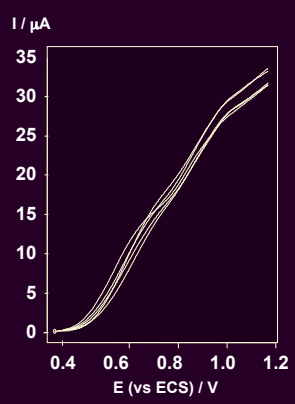
Control Chart



Data Treatment : Shelf Life Control Chart

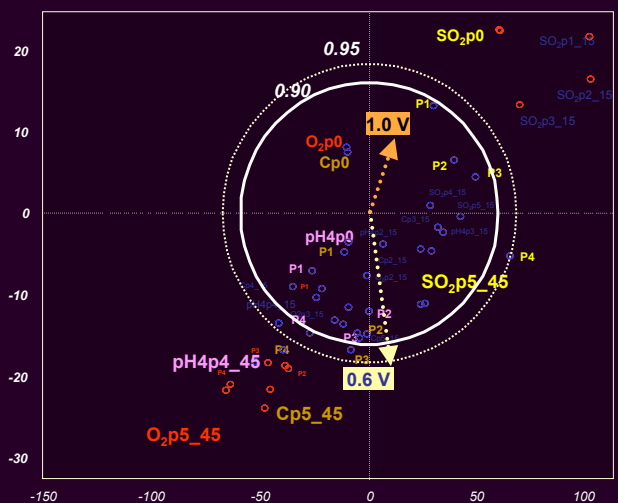
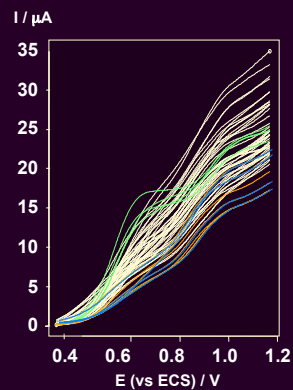


R-SVD Loadings Directions: High Low Reactivity



Confidence Intervals of the Model

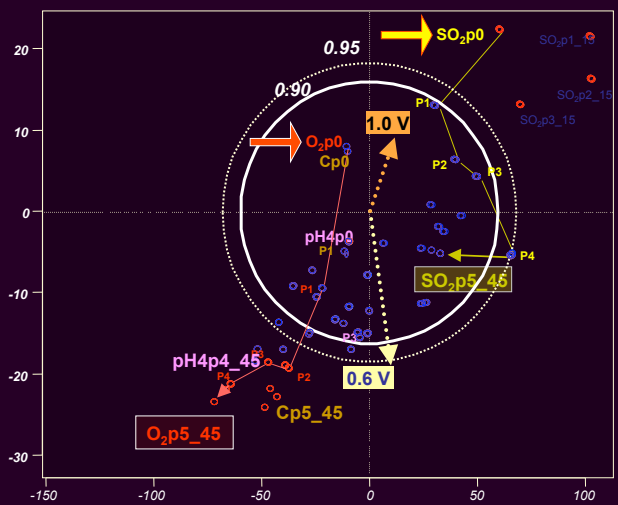
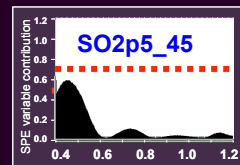
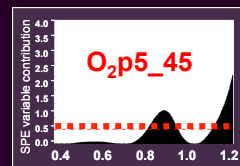


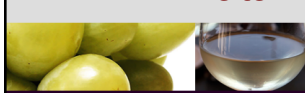


Data Treatment : SPE variable contribution

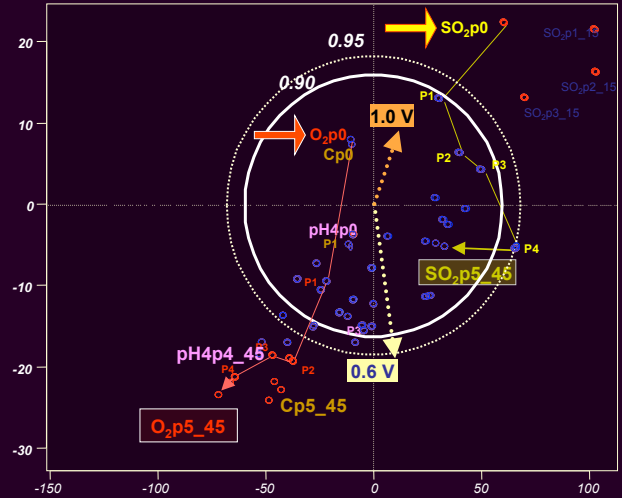
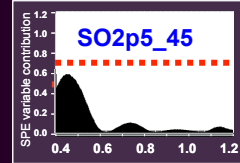
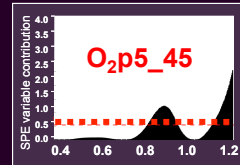


Contribution Plot





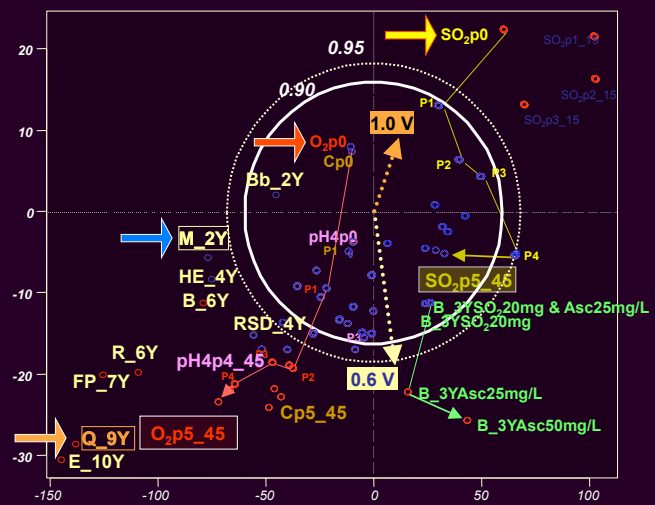
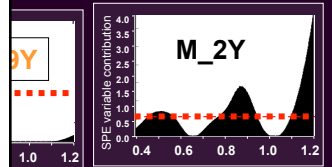
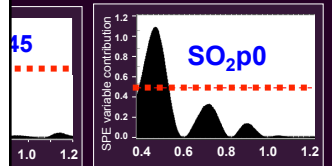
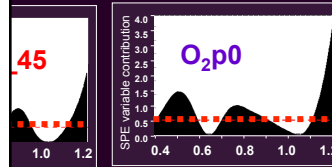
Contribution Plot

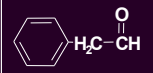
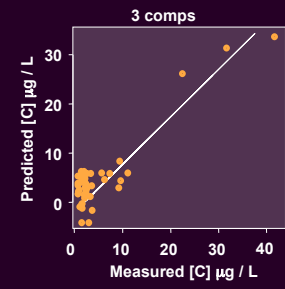
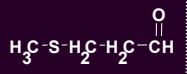
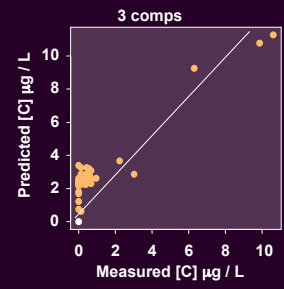


Data Treatment : SPE variable contribution



Contribution Plot

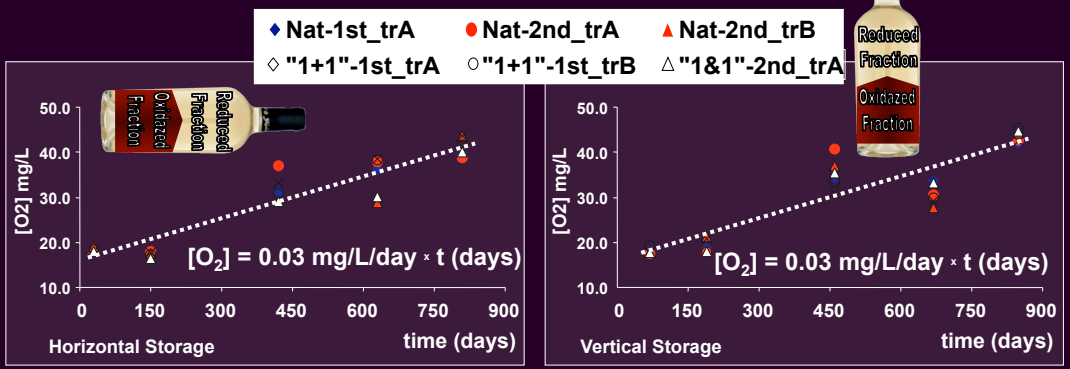


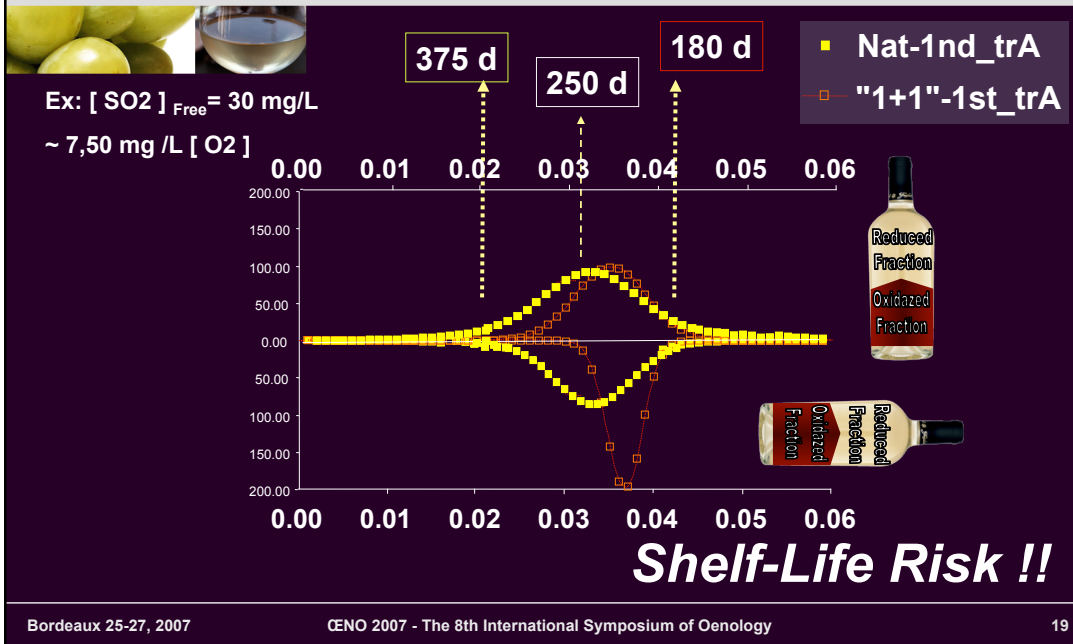


PLS (MODEL)	1 Comps	2 Comps	3 Comps
X (Methional)	68.2	79.88	86.99
Y (38 samples)	87.5	88.50	88.72
r (adjusted)	0.9121	0.9259	0.9248

PLS (MODEL)	1 Comps	2 Comps	3 Comps
X (Phenylacetaldehyde)	54.50	66.65	87.55
Y (45 samples)	79.32	82.18	82.83
r (adjusted)	0.8906	0.9065	0.9101

Oxygen Permeability: Storage Position





Conclusions

- In order to optimize shelf-life three conditions must be addressed and become standardized for industry application;
 - Dissolved oxygen must be known;
 - Both the quantity and quality of antioxidants present in solution need to be evaluated;
 - Thirdly the permeability of the stopper need to be provided.
- Large dispersion on $[O_2]$ transmission in all categories mainly on natural corks. The position of storage has a major impact on the dispersion amplitude: - Up position higher risk.



Universidade do Minho

F. Bento, D. Geraldo



Universidade de Aveiro

A. Silva



Universidade do Porto, Farmácia

P. Guedes Pinho