Redox processes in wines - measures to reduce the effects of oxidation

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Abstract
The quality of the wine reaching the consumer is decisively determined by the redox processes, carried out in the fermentation processes and in the evolution of the wine. The redox potential of wine reflects the state of balance between the concentrations of oxidized and reduced substances and, through it, sensory expression, stability, evolutionary pathways. Redox potential refers to a concrete redox couple. As many redox couples are present in wines that intervene with its input, the measured redox potential of the wine represents a mixed potential. In wines, between the redox partners of the couples, reversible and irreversible equilibria are found. With the platinum (inert) electrode, the redox potentials of the reversible and not the irreversible equilibria are determined. Therefore, the measurement result refers to a mixed redox potential. Although it was considered that the reduction potential of wines indicates their redox state, this fact is not eloquent, since it should reflect the degree of oxidation of polyphenols, the most easily oxidized constituents. However, there is evidence that polyphenols and quinones do not contribute to the redox potential, which is generated by the oxidation of ethanol at platinum electrodes and largely depends on the oxygen concentration at the time of measurement. In turn, the concentration of dissolved oxygen is a function of the matrix, in which it is dissolved, and the temperature. At 20oC, approximately 8.4 mg/L is solubilized in wine, 6.9 mg/L in must and 15 mg/L in ethyl alcohol (66%). Since the solubility of oxygen is higher in water and alcohol, it follows that the other components of the must and wine have some impact on the O2 concentration. Thus, the redox potential is not decisive for the redox state of the wines, but the redox potentials of the likely reactant couples provide useful information on the possible mechanisms involved in wine oxidation. The reaction of polyphenols with oxygen is mediated by iron and copper and accelerated by sulfite, which then reduces the quinones that are produced back to the polyphenol. The objective of this paper is to elucidate the redox processes that occur throughout the winemaking process, their role on wine quality.