Oxygen Transport through Cork

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Cork stopper is still the most used stopper to seal wine bottles and to preserve wine during storage. During post-bottling aging, oxygen transfer through the stopper occurs and can lead to oxidation reactions. When in excess, a final result of such reactions is color change (browning) and off-flavor appearance, which modify the organoleptic properties of wine. Therefore, it is important to understand how the transport of gases, particularly oxygen, occurs through them. Up to now, the limiting step of gas transfer through cork was not clearly determined. Performing permeation experiments at different pressures we concluded that the limiting step of oxygen transport through cork follows a Fickian mechanism [1] with two different diffusion regimes. We could also investigate the heterogeneity of the diffusion data for different cork stopper [2] and relate it to the heterogeneous internal structure of the cork [3].

References

[1] Lagorce-Tachon, A., Karbowiak, T., Simon, J. M., Gougeon, R. and Bellat, J. P. (2014). *Diffusion of Oxygen through Cork Stopper: Is It a Knudsen or a Fickian Mechanism?* Journal of Agricultural and Food Chemistry 62: 9180-9185.

[2] Lequin, S., Chassagne, D., Karbowiak, T., Simon, J. M., Paulin, C. and Bellat, J. P. (2012). *Diffusion of oxygen in cork*, Journal of Agricultural and Food Chemistry 60: 3348-3356.

[3] Lagorce-Tachon, A., Karbowiak, T., Loupiac, C., Gaudry, A., Ott, F., Alba-Simionesco, C., Gougeon, R. D., Alcantara, V., Mannes, D., Kaestner, A., Lehmann, E. and Bellat, J.-P. (2015). *The cork viewed from the inside.* Journal of Food Engineering 149: 214-221.