FORMATION AND COLLAPSE OF CHAMPAGNE FOAM

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The foam aspect is certainly the most important organoleptic property of a Champagne wine, the one that conveys a festive mood to the celebration of happy events. Champagne foam is essentially evanescent: generous upon pouring into the glass, it collapses in a few seconds to form a "collerette" of bubbles at the surface of the wine which is fed by trains of bubbles nucleated at the bottom of the glass. One may wonder why the foam of champagne is so different from the ones of beer, of gaseous water, or of any sparkling soft drinks? Why the sparklingness is glass dependent and why some bottles provoke a liquid gushing upon filling? Why the bubbles of a vintage wine are the smallest and their collars the more stable?

To answer these questions, we have studied the physics of champagne foam by a multiscale approach to understand how its macroscopic behavior results from physico-chemical phenomena occurring at a microscopic scale. Our main findings are the following. (i) The overall foam formation results from a strong degassing process, whereas the fine bubbling in the glass is due to bubble heterogeneous nucleation from pre-existing gaseous sites [1] and the liquid gushing during bottle filling is related to a chemically assisted heteronucleation [5]. (ii) Alcohol hinders the foam stabilization by preventing the adsorption of yeast glycoproteins contained in the wine at the bubble surface; actually, in alcoholic solution, they aggregate together, which sterically stabilizes horizontal films, but which prevents Gibbs-Marangoni effect to be efficient [2-4]. (iii) Eventually, we will show how the wine age influences the champagne foam quality.

References

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