

Silica nanoparticles for the microbial control of wine in *in vitro* study using *Oenococcus oeni*

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Nowadays, the need to explore new antimicrobiological agents in wine production is of crucial importance. Therefore, silica nanoparticles seem to be one of the most promising solution in winemaking which creates an efficient protection of wine against the growth of undesired species of microorganisms and to safely remove wine microorganisms.

This contribution describes the study on silica nanospheres as a wine stabilisation agent, with *Oenococcus oeni* (DSM 7008) as a model strain. The experiment was conducted firstly on model solutions of phosphate-buffered saline and 1% glucose. Their neutralising effect was evaluated under stirring with the addition of SiO₂ (0.1, 0.25, and 0.5 mg/mL).

Generally, the higher concentration of nanospheres under continuous stirring the greater decrease in cell counts was detected. Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) analyses exhibited extensive degradation to the bacterial cells after stirring with silica nanomaterials (Fig. 1). Then, the neutralising effect of 0.5 mg/mL SiO₂ was checked in young red wine while stirring, where cell counts were reduced by over 50%.

The obtained results indicate that silica nanospheres can serve as an potential strategy to reduce or substitute the use of sulphur dioxide in the microbial stabilisation of wine.

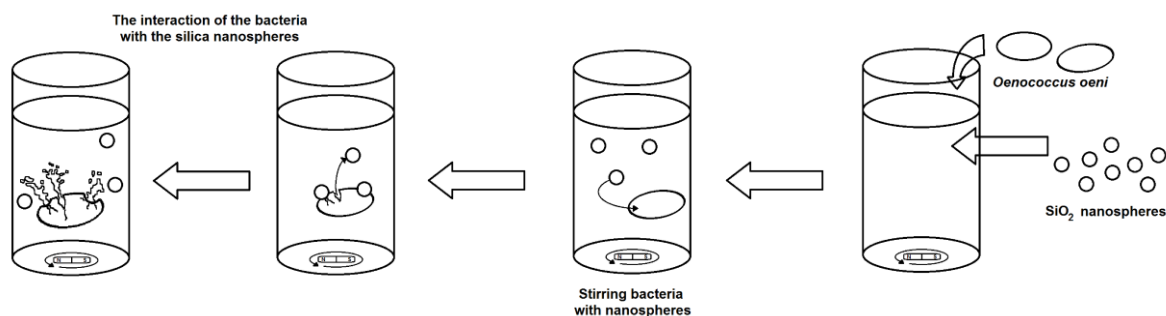


Figure 1. The diagram of *O. oeni* (DSM 7008) cell disruption and release of cytoplasm caused by silica nanospheres.