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# Shifting gas-to-liquid partitioning coefficient of odorous compounds to liquid in biotechniques using additives

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## ABSTRACT

Volatile organic compounds with high gas-to-liquid partitioning coefficients are difficult to treat in water based biotechnologies, due to the low mass transfer from gas to liquid. In this study additives to water were evaluated for the enhancement of the partition coefficient towards liquid.

Gas-to-liquid partitioning coefficients ( $K_{AW}$ ) were determined for dimethyl sulphide, dimethyl disulphide, 2-methylpropanal, 3-methylbutanal and hexanal in aqueous solutions of an additive. Four major groups of additives were tested (at a concentration of 10 g L<sup>-1</sup>): (i) sugar based additives (cyclodextrin, maltodextrin and chitosan), (ii) clay mineral (Clinoptilolite), (iii) proteins (haemoglobin) and (iv) lignin based produces (lignosulfonate). All  $K_{AW}$  values were measured by using a dynamic absorption method based on SIFT-MS.

An optimal enhancement of  $K_{AW}$  towards water was obtained for cyclodextrins (CD, alpha-, beta- or hydropropylbetacyclodextrin) in the sugar based group. In general, all  $K_{AW}$  values decline in function of CD concentration. The host-guest sizing matching reveals that CD has the lowest absorption capacity for dimethyl sulphide in beta-CD (little reduction of  $K_{AW}$ ) and the highest for hexanal in alpha-CD (high reduction of  $K_{AW}$ ). Further was chitosan only effective for the aldehyde compounds, due to the binding of the amine group on chitosan with the aldehyde group. All other additives did not enhance the  $K_{AW}$ . In some cases a reverse effect was apparent as a result of a high salt concentration (lignosulfonate and haemoglobin) or to low absorption capacities (Clinoptilolite and maltodextrin).

Keywords: henry's law constant, partitioning, volatile organic compounds, dimethyl sulfide