

TN06—Removal from and addition of sulfur dioxide to must, juice and wine

Scope

A means of calculating the appropriate addition of hydrogen peroxide required to reduce the concentration of sulfur dioxide (SO₂) by a desired amount is described. Brief notes on techniques for the addition of SO₂ to musts and wine are also given.

1. Removal of SO₂ from wine

A. Hydrogen peroxide

The removal of sulfur dioxide from wine using hydrogen peroxide (H₂O₂) is an effective, and if performed carefully, safe procedure. The H₂O₂ reacts with the free SO₂ in the wine, oxidising it to sulfate. After such removal, further free SO₂ may be generated from the remaining bound fraction.

The H₂O₂ should be added in a dilute form (recommend less than 1% w/v), slowly, with adequate mixing (e.g. tank recirculation) to avoid localised oxidation. The wine should then be allowed to equilibrate for at least several hours before confirmatory analysis of the concentration of remaining free and bound sulfur dioxide in the wine is done to confirm the success of the addition.

The Australian Food Standards Code part P4 lists H₂O₂ amongst several legal additives. A copy of this document is available from the Institute on request. It sets a maximum concentration of H₂O₂ permitted in wine of 1 mg/L, and a maximum concentration of soluble sulfates at 20°C of 2 g/L. The maximum concentration of total sulfur dioxide is, at the time of preparation of this document, 300 mg/L (“for wines containing greater than 35 g/L of sugars”; the limit is 250 mg/L for wines with less than this concentration of sugars); this is, along with all aspects of the Standard, subject to review from time to time. The legality of H₂O₂ use varies from country to country; and at the time of preparation of this document, it is not a permitted additive in the European Union, for example.

The following guidelines detail how to calculate the quantity of H₂O₂ to add in order to remove a given concentration of SO₂. The Institute is happy to give further specific advice regarding the practical aspects of the operation if required. Winemakers should be aware of the potential risks of a loss of wine quality associated with hydrogen peroxide additions if care is not exercised. H₂O₂ is a strong, non-specific oxidising agent, and under the conditions of use in wine it may have a limited effect on various other wine components.

1. Estimate concentration of free SO₂ to be removed.

Allow a 10% safety margin. For example, if a wine has a free SO₂ of 50 mg/L and it is desired to reduce this to 25 mg/L, then 25 mg/L must be removed. However, it is wise to allow a 10% safety margin, so calculate H₂O₂ addition on the basis of removing 22 mg/L.

2. Calculate corresponding amount of SO₂

Multiply concentration of free SO₂ to be removed by the volume of wine (L) in question. It is advisable at this stage to divide the result by 1000 to express the answer in terms of grams (rather than milligrams).

3. Calculate corresponding amount of H₂O₂

Molecular weight of SO₂ = 64

Molecular weight of H₂O₂ = 34

Therefore, corresponding amount of H₂O₂ = 34/64

4. Express amount of H₂O₂ calculated as a measurable volume

The amount of H₂O₂ calculated above must be expressed in terms of volume, according to the strength of the solution used. Commercial H₂O₂ is typically 30–35% w/v.

5. Caution

- Never decrease the calculated free SO₂ to less than 5 mg/L.
- Always allow for a margin of safety.
- SO₂ will re-equilibrate in solution after a fairly short time. It is quite common to have to add H₂O₂ in several stages in order to achieve the final SO₂ concentration desired.

6. Numerical example: *Removal of 25 mg/L SO₂ from 1700 L wine.*

Calculate the amount of SO₂ to be removed: 25 mg x 90% x 1700 L
 = 38250 mg (= 38.3 g)

Calculate corresponding amount of H₂O₂: 38.3 g x 34/64
 = 20.32 g

Express amount of H₂O₂ as a volume: Assume 35% w/v (i.e. 35 g/100 mL) H₂O₂ used
 = 20.32 g x 100 mL/35 g
 = 58 mL

B. Yeast addition

If you wish to reduce the concentration of SO₂ in juice prior to inoculation the use of a ‘sacrificial’ yeast cell culture has been found to be quite successful. Please contact the Industry Services group for further information (email: helpdesk@awri.com.au).

2. The addition of sulfur dioxide:

The addition of sulfur dioxide may be made using ‘pure’ sulfur dioxide (available as a pressurised liquid), as an aqueous solution which may be prepared by bubbling gaseous SO₂ into water, or as solid salts, which may be dissolved in water or wine before addition.

The amount of SO₂ added as an aqueous solution depends on the strength of that solution, and may be calculated from its concentration, normally expressed as % weight/volume.

The two most commonly-used salt forms are potassium metabisulfite (K₂S₂O₅, often abbreviated colloquially to *PMS* and less commonly *KMS*) and sodium metabisulfite (Na₂S₂O₅, or *SMS*). The proportion of SO₂ in each is as follows:

- PMS: 57 % w/w
- SMS: 67 % w/w

Note that the remaining proportions of these products are potassium and sodium salts, respectively; the addition of these to wine may or may not be desirable.

Note that, as of 8 March 1995, sodium salts of oenological products such as casein and metabisulfite are NOT permitted additives as additives to Australian wine. SMS may no longer be used as an additive to wine.