Sulfur Dioxide (SO_2) 3 Ways

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Why to run it: SO_2 management is essential for quality wine production.

What it measures: SO_2 content in mg/L

Basic bench-top: Ripper Method (Iodine titration)

Materials:

- Burette, stand, and clamp
- Volumetric pipette
- High-intensity light source

Analysis time: 10-15 minutes per sample

Accuracy: ±10% v/v

Hazards: Sulfuric acid, used to acidify the sample, must be stored and handled appropriately to prevent acid burns.

Cost: $200 for titration apparatus; $20-50 for reagents

Theory and Practice: A starch solution is added to a wine sample to serve as a color indicator, and the sample is titrated with iodine, which binds with SO_2. Once all of the SO_2 is bound, additional iodine reacts with the starch solution, and the subsequent color change signals the end of the titration. The Ripper method can be used to measure both free and bound SO_2, but in red wine analysis it is difficult to determine the endpoint color. Both ascorbic acid and metabolites in botrytis-affected wines cause interference that results in erroneous readings.

Introductory instrumental: Aeration/Oxidation (AO)

Materials:

- Aeration/Oxidation apparatus
- Burette and burette stand
- Assorted flasks or beakers
- Timer
- Ice bucket and chipped ice
- Heating mantle or hot plate

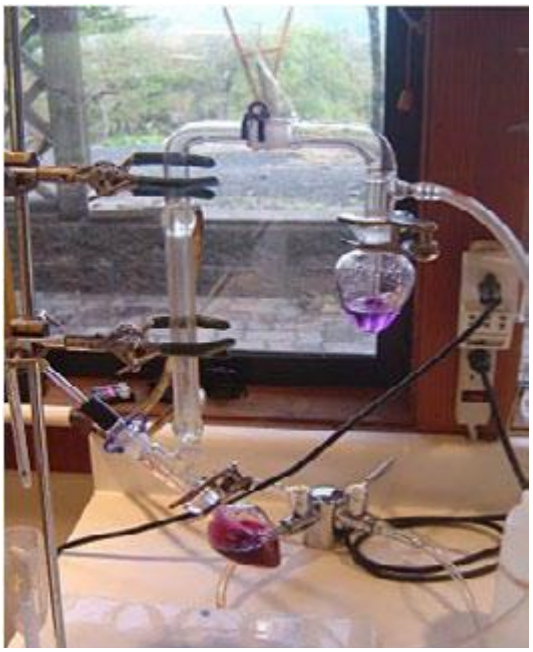
Analysis time: 30 minutes

Accuracy: ±3% v/v

Hazards: Phosphoric acid, used to acidify the sample, must be stored and handled appropriately to prevent acid burns. During total SO_2 analysis, the heating mantle and sample flask become very hot and can cause burns.

Cost: $500+ for apparatus purchase; $30-50 for reagents

Theory and Practice: Phosphoric acid is used to acidify the wine sample, liberating SO_2 (aeration). A stream of air removes the SO_2 from the wine and then carries it through a condenser and into a hydrogen peroxide trap, where it is oxidized to H_2SO_4. The H_2SO_4 is titrated with standardized NaOH, and the titrant volume is used to calculate SO_2 content. A/O can be used for both free and total SO_2 measurement.



The A/O method is not thrown off by red wines...at least any more than it's thrown off by white wines.
http://tfwblog.blogspot.com/feeds/posts/default

Chemistry geek: Foss FIAStar Segmented-Flow analyzer

Materials:

- Foss FiaStar Unit(s)
- Autosampler
- Sample vials

Analysis time: 5 minutes per sample, following 1 hour of start-up and calibration

Accuracy: ± 2% v/v

Hazards: None

Cost: Approx. $15,000 per unit for FiaStar; $10,000 for autosampler unit

Theory and Practice: Flow injection analysis works much like aeration/oxidation, but it is automated and performed on a microscale. Small amounts of sample are aspirated into small-bore tubing, with each sample separated by an air bubble. Pumps move the samples through a system of cartridges, where they undergo a series of reactions. The final reaction combines SO_2 with a reagent to form a yellow dye, which is read photometrically and analyzed to calculate an SO_2 reading. This method is very accurate, very expensive, and best used in large wineries or labs with high sample throughput. Flow injection analysis can be used for both free and bound SO_2; free SO_2 analysis requires purchase of one FIASTar unit, while total requires two.

But what about… Titrets®

Titrets®, produced by CHEMetrics, are essentially individual, encapsulated Ripper method kits. All necessary reagents are contained in the ampoule or the valve assembly and react when wine is aspirated through the ball

valve into the ampoule. Titrets® are designed to be used with dry, white wines, and ascorbic acid and tannins can result in erroneously high readings. CHEMetrics suggests that error can be as high ±10ppm and that any reading higher than 40ppm be confirmed with an alternate method.

A Foss Fiastar. Image from foss.us. Sure, it's state of the art, but the A/O setup has the whole mad-scientist thing going on.