



FOCUS ON H₂S: PART 5

REMOVING COPPER-H₂S COMPLEXES USING PVI/PVP



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[Basic Wine](#)

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In [Part 1](#) of this *Focus on H₂S* series, the implications of fining a reductive wine with copper(II)sulphate were discussed. Cu²⁺ will bind with H₂S to form a copper-H₂S complex, however, contrary to popular belief, this **complex is not readily removed from the wine** by racking or general filtration. The copper-H₂S complex, therefore, remains in the wine and during ageing H₂S can be released from these complexes, resulting in the **latent formation of reductive aroma**.

By reducing the need for the use of copper (by managing H₂S formation, to begin with), the occurrence of these problematic complexes can be avoided. However, often the unwanted development of reductive H₂S odours necessitates the use of copper as a (temporary) remedial action.

Ideally, the complex should be removed from the wine medium after the reaction of the added copper to H₂S. Different products show some potential for the removal of these complexes and researchers have been investigating a **co-polymer, PVI/PVP, as a potential fining agent**.

What is PVI/PVP

PVI/PVP is a polyvinylimidazole and polyvinylpyrrolidone adsorbent cross-linked copolymer. The polymer is insoluble and slightly hygroscopic. It has a number of functional imidazole groups which connect selectively and scavenge various metals removing it from wine.

PUTTING PVI/PVP TO THE TEST

A recent trial at The Australian Wine Research Institute (AWRI) assessed the impact of two commercially available **PVI/PVP co-polymer products on the metal concentration of 38 commercially available white and red wines**¹.

MATERIALS AND METHODS

Two commercial cross-linked polymers provided by Enartis were tested.

- Stabyl MET (0.35 g/L)
 - **Co-polymer of PVI/PVP and amorphous silica.**
- Claril HM (0.53 g/L)
 - **Co-polymer of PVI/PVP and pre-activated chitosan** (chitosan can aid the removal of heavy metals from wine and is also used as a stabilisation and clarification agent).

For each of the 38 commercial wines, one control sample was left untreated, while two more samples were treated with either Stabyl MET or Claril HM. Samples were mixed for three hours, after which they were filtered using 0.2 µm regenerated cellulose filter.

RESULTS

For the samples treated with Stabyl MET, the **copper concentration decreased** by an average of 50%¹. When treated with Claril HM, the **average decrease in copper concentration was slightly higher** (59%)¹. Therefore, **both products showed potential as fining agents for the removal of copper and copper-H₂S complexes**.

Results from another study also showed that more copper will be removed when a **higher addition rate of PVI/PVP** is applied². In general, the addition of 20-50 g/hL³ will effectively remove most, if not all, of the copper (and therefore copper-H₂S complexes).

The AWRI study did, however, report **large variation in effectivity between the different wines** tested and the products were, in general, less efficient in decreasing the copper concentrations in red wines when compared to white wines. Of the two products tested, Claril HM seems to be more **successful and consistent for the treatment of different wine styles**³ probably due to the dual function of the PVI/PVP and the chitosan.

It is important to note that, for some of the wines, the PVI/PVP products showed **no measurable effect** on copper concentration. The reason for the difference in effectivity and the inherent wine factors responsible for this variation is unknown and needs further investigation.

THE EFFECT ON THE SENSORY COMPOSITION OF THE WINE

Informal sensory evaluation revealed that the panellists were either **not able to distinguish between the control and the treated sample** or that the **sensory differences reported were not considered to have a negative impact** on the perception of the wine^{1,2}.

Another study reported a slight, but significant **decrease in the concentration of phenolic compounds** after treatment with PVI/PVP². This adjustment of the phenolic content might affect the mouthfeel and colour of the wine, however sensory evaluation of tested samples **showed no notable effect**. It seems that the lower molecular weight phenolic molecules are more likely to be removed by PVI/PVP and this could, in fact, **improve oxidative and colour stability**².

CONCLUSION

PVI/PVP can successfully remove copper as well as other metals such as iron and aluminium from wine. By removing copper and copper-H₂S complexes, the **risk of the latent development of reductive aroma (due to H₂S release from metal complexes) can be minimised.** Additional advantages such as **improved shelf life** (due to the minimising the risk of metal related oxidative processes) should also be considered.

The effect of the wine composition on the effectivity of PVI/PVP needs to be further investigated as **great variability** has been reported. Therefore, **conducting fining trials** before applying the treatment to larger volumes of wine, **comes highly recommended.** These trials will not only ascertain the effectivity of metal removal but it will also ensure that desired sensory outcomes are achieved.

RECOMMENDATIONS⁴ FOR CONDUCTING TRIALS AND USING CLARIL HM AND STABYL MET IN THE CELLAR

- For trials, use a base solution of 5-10% of the polymer in distilled water
- Periodically mix the solution for one hour to ensure proper rehydration
- Use a pipette tip with a wide opening (or cut the first mm of the tip) to prevent clogging and make sure the base solution is homogenous before pipetting
- **The fining agent settles rapidly.** When conducting trials, ensure sufficient contact time by keeping the fining agent in suspension. When adding to the tank, make sure the wine is being mixed properly to avoid rapid and direct settling.
- The efficiency of the product is dependent on **contact time.** Mix the sample continuously for 0.5 to 1 hour or periodically for 2 hours. Ensure that the trial contact time is the same as the tank contact time.
- Allow to settle for 24 hours
- Filter through a rough prefilter
- Adhere to provider recommendations

REFERENCES

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