

Application Bulletin



Interesting for:
Wine growers and vintners
Food product laboratories

No. 112/1 e

Quantitative determination of metals precipitated from wine by potassium ferrocyanide (sometimes known as the "décassage" of wine)

<p>Summary</p>	<p>Wine sometimes contains heavy metals which can be precipitated out by the addition of potassium ferrocyanide. Generally, these are quantities of iron ranging between 1 and 5 mg, and exceptionally up to 9 mg Fe/L. Zinc, copper and lead – in descending order of quantities – may also be present. In order to estimate the quantity of potassium ferrocyanide necessary for the "décassage" of the wine, only very complicated and relatively inaccurate methods have been described up till now. This bulletin permits to obtain easily accurate results with a simple instrumentation. The results are available in a short time.</p>									
<p>Chemistry of the method</p>	<p>An excess of potassium ferrocyanide gives soluble Prussian blue:</p> $K_4[Fe(CN)_6] + Fe^{3+} \rightarrow KFe^{3+}[Fe(CN)_6]$ <p>Only when Fe^{3+} is present in either stoichiometric proportions or in excess do we obtain true, insoluble Prussian blue:</p> $3 K_4[Fe(CN)_6] + 4 Fe^{3+} \rightarrow Fe_4^{3+}[Fe(CN)_6]_3$									
<p>Apparatus</p>	<ul style="list-style-type: none"> ▶ e.g. 2.691.00XX pH-Meter with 6.0402.100 combined platinum electrode ▶ 2.585.0010 Polarizer ▶ 2.485.003X Manual Titration Stand with 6.3005.213 Exchange Unit 									
<p>Reagents</p>	<ul style="list-style-type: none"> ▶ Potassium ferrocyanide: Take 9.839 g $K_4Fe(CN)_6$ or 11.345 g $K_4Fe(CN)_6 \cdot 3H_2O$, dissolve in distilled water and make up to 1 litre. This solution will keep fairly well in a brown glass bottle. Shortly before use it should be diluted 1:10 with distilled water. ▶ 1 mol/L potassium chloride: Dissolve 74.56 g KCl in distilled water and make up to 1 litre. ▶ App. 0.2 mol/L hydrochloric acid: Dissolve 20 mL conc. HCl in distilled water and make up to 1 litre. 									
<p>Determination</p>	<p>Pipette out 100 mL of wine, add 10 mL each of KCl and HCl, and titrate against potassium ferrocyanide solution added in quantities of 0.2 mL at a time under the following conditions:</p> <table style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="padding-right: 20px;">pH-Meter</td> <td style="padding-right: 20px;">mV-range</td> <td></td> </tr> <tr> <td style="padding-right: 20px;">585</td> <td style="padding-right: 20px;">U_{pol}</td> <td style="padding-right: 20px;">+ 500 mV</td> </tr> <tr> <td></td> <td style="padding-right: 20px;">sensitivity</td> <td style="padding-right: 20px;">5 $\mu A/V$</td> </tr> </tbody> </table> <p>After each 0.2 mL addition, wait 30 seconds. Plot the curve (mL against mV). The titration end-point is the point of inflection of the curve. As an example, a determination on a white wine is shown at the end of this bulletin.</p>	pH-Meter	mV-range		585	U_{pol}	+ 500 mV		sensitivity	5 $\mu A/V$
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585	U_{pol}	+ 500 mV								
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<p>Calculation of results</p>	<p>The heavy-metal content is reported as mg Fe/L. With a sample of 100 mL wine, 1 mL of 1:10 potassium ferrocyanide solution is equivalent to 1 mg Fe/L.</p>									

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Bestimmung des Kaliumhexacyanoferrat(II)-Bedarfes der Weine mittels einer amperometrischen Methode.
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- ▶ Rentschler/Tanner
Anleitung für die Getränke-Analyse
Flugschrift Nr. 55, 8. Auflage 1976
Mitteilungen der Eidg. Forschungsanstalt für Obst-, Wein- und Gemüsebau, Wädenswil

- ▶ Schweizerisches Lebensmittelbuch, 5. Auflage II. Band Kapitel 30, Wein Eidg. Druck- sachen- und Materialzentrale, Bern 1973

Titration curve

Trial: white wine

