



SLOVENSKI STANDARD

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Vlaknine - Določanje števila Kappa

Pulps -- Determination of Kappa number

Pâtes -- Détermination de l'indice Kappa

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Pulps — Determination of Kappa number

Pâtes — Détermination de l'indice Kappa



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 6, *Paper, board and pulps*.

This third edition cancels and replaces the second edition (ISO 302:2004), which has been technically revised.

Pulps — Determination of Kappa number

1 Scope

This International Standard specifies a method for the determination of the Kappa number of pulp. The Kappa number is an indication of the lignin content or bleachability of pulp.

This International Standard is applicable to all kinds of chemical pulps and semi-chemical pulps within the Kappa number range 1 to 100. For pulps with a Kappa number exceeding 100, use the chlorine-consumption procedure (ISO 3260) to describe the degree of delignification.

To achieve the greatest precision and accuracy, the sample size has to be adjusted so that the consumption of permanganate falls between 20 % and 60 % of the amount added.

NOTE There is no general and unambiguous relationship between the Kappa number and the lignin content of pulp. The relationship varies according to the wood species and delignification procedure. All compounds oxidized by KMnO_4 , not only lignin, will increase the consumption of KMnO_4 , and thereby increase the Kappa number.^[8] If the Kappa number is to be used to derive an index of pulp lignin content, specific relationships will have to be developed for each pulp type.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 638, *Paper, board and pulps — Determination of dry matter content — Oven-drying method*

ISO 7213, *Pulps — Sampling for testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

oxidation capacity

relative amount of potassium permanganate reduced (expressed as MnO_2) of the total oxidation capacity

3.2

total oxidation capacity

oxidation capacity (permanganate consumption) when all permanganate is reduced into Mn^{2+}

3.3

Kappa number of pulp

number of millilitres of 0,02 mol/l potassium permanganate solution consumed under the specified conditions by one gram of pulp (calculated on an oven-dry basis)

Note 1 to entry: The results are corrected to a value corresponding to that obtained when 50 % of the total oxidation capacity of the permanganate is consumed in the test at a temperature of 25 °C.

4 Principle

Disintegrated pulp is allowed to react with a specified amount of potassium permanganate solution for a given time. The amount of pulp is chosen so that about 50 % of the total oxidation capacity of the permanganate is left unconsumed at the end of the reaction time.

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The main reactions are as follows:

Residual lignin + other oxidizable compounds + $\text{MnO}_4^- + 4\text{H}^+ \rightarrow$ oxidized lignin + other oxidized compounds + excess $\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$

$2\text{MnO}_4^- + 10\text{I}^- + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{I}_2 + 8\text{H}_2\text{O}$

$\text{MnO}_2 + 4\text{H}^+ + 2\text{I}^- \rightarrow \text{Mn}^{2+} + 2\text{H}_2\text{O} + \text{I}_2$

$2\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$

NOTE By theoretical calculation and experimental observation, a consumption of 60 % (mass/mass) is actually the end point of the consumption for the permanganate ions, at which point the ions have been reduced to MnO_2 . Further oxidation, performed by means of MnO_2 should be considered as “out of range”. By adding potassium iodide solution, the reaction is terminated and the free iodine is titrated with sodium thiosulfate solution. The value so obtained is corrected to 50 % consumption of the total oxidation capacity of permanganate.

5 Reagents and materials

Use only chemicals of recognized analytical grade and only distilled water or water of equivalent purity.

5.1 Sulfuric acid, $c(\text{H}_2\text{SO}_4) = 2,0 \text{ mol/l}$.

Add with caution 112 ml of sulfuric acid, H_2SO_4 , of density 1,84 g/ml, to about 600 ml of water. Allow to cool and dilute to 1 litre with water.

5.2 Potassium iodide, $c(\text{KI}) = 1 \text{ mol/l}$.

Dissolve 166 g of potassium iodide, KI, in a 1 000 ml volumetric flask and fill up to the mark with water.

5.3 Potassium permanganate, $c(\text{KMnO}_4) = (0,020 \pm 0,001) \text{ mol/l}$.

Dissolve 3,161 g of potassium permanganate, KMnO_4 , in a 1 000 ml volumetric flask and fill up to the mark with water.

NOTE Fresh solution is stable for at least 6 months if stored in a dark bottle.

5.4 Sodium thiosulfate, $c(\text{Na}_2\text{S}_2\text{O}_3) = (0,200 0 \pm 0,000 5) \text{ mol/l}$.

Dissolve 49,65 g of sodium thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$, in a 1 000 ml volumetric flask and fill up to the mark with water.

5.5 Starch indicator, 2 g/l solution.

NOTE Commercially available standard solutions may be used.

6 Apparatus and equipment

Ordinary laboratory equipment and the following.

6.1 Agitator, of the propeller type, made of glass or other noncorrosive material (a plastic- or glass-covered magnetic stirrer may be used instead).

6.2 Wet-disintegration apparatus or blender, high-speed mixer, capable of disintegrating the pulp completely with minimum damage to the fibres.

6.3 Water bath, capable of maintaining a temperature of $(25,0 \pm 0,2) ^\circ\text{C}$ in the reaction vessel (see [8.3](#) regarding temperature correction).