

Pulps — Determination of limiting viscosity number in cupri-ethylenediamine (CED) solution

ICS 85.040

National foreword

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A list of organizations represented on PAI/11 can be obtained on request to its secretary.

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Pulps — Determination of limiting viscosity number in cupri- ethylenediamine (CED) solution

*Pâtes — Détermination de l'indice de viscosité limite en utilisant une
solution de cupri-éthylènediamine (CED)*



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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.

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ISO 5351 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulps*.

It cancels and replaces ISO 5351-1:1981, which has been technically revised.

Introduction

The viscosity (or dynamic viscosity), symbol η , of a fluid is defined by the Newtonian equation

$$\tau = \eta \dot{\gamma} \quad (1)$$

where

τ is the shear stress;

η is the viscosity;

$\dot{\gamma}$ is the velocity gradient dv/dz (v being the velocity of one plane relative to the other and z the co-ordinate perpendicular to the two planes).

In non-Newtonian behaviour, normally the case with high molecular mass polymer solutions such as cellulose, the ratio of the shear stress to the velocity gradient varies with the shear stress.

The data required for evaluation of the limiting viscosity number of pulp in dilute solutions (for terms and definitions, see Clause 3) are derived by means of a capillary-tube viscometer. The results of these measurements are seriously affected by the shear rate.

The concentration c of the pulp is therefore chosen so that, if multiplied by the limiting viscosity number $[\eta]$, it gives a product $[\eta] \times c$ equal to $3,0 \pm 0,4$, corresponding to a viscosity ratio η/η_0 equal to 6 to 10. The determination is then carried out at a reproducible shear rate G of $(200 \pm 30) \text{ s}^{-1}$; this involves the employment of two viscometers, one for calibration and one for the measurement of the viscosity of the pulp.

The viscosity of a pulp in CED solution gives an indication of the average degree of polymerization (DP) of the cellulose (see Annex C). Such a measurement therefore gives a relative indication of the degree of degradation (decrease in cellulose molecular mass) resulting from the pulping and/or bleaching process.

Caution should be taken in drawing conclusions regarding strength properties of the pulp strictly from viscosity measurements unless previous investigation has identified the relationship. A direct relationship between pulp strength and viscosity has not been found.

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