
**Lignins — Determination of
carbohydrate composition in kraft
lignin, soda lignin and hydrolysis
lignin**



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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

There is a rapidly-growing worldwide interest in developing novel applications for lignin as a replacement for fossil-based raw materials in products including carbon fibre, adhesives, thermoplastics, resins, composites, and various chemicals. In addition, the use of lignin in these and other applications will offload recovery boilers in pulp mills, allowing more efficient recovery of pulping chemicals and increased pulp production. These benefits translate into reduced environmental impact and improved sustainability owing to the use of renewable materials.

In order to ensure harmonization of testing practices among lignin producers and to facilitate trade, the use of international standard methods is needed to characterize the lignin raw material for a wide range of properties such as general composition, functional groups, molecular weight distribution, particle size, structural features, and thermal behaviour and stability.

The carbohydrate composition - the contents of the five principal, neutral monosaccharides; arabinose, galactose, glucose, xylose and mannose - provides chemical information about the main polysaccharides in lignin. The total content and composition of carbohydrates also provide an indication of the purity of the lignin isolated from the kraft pulping process (kraft lignin) or the soda pulping process (soda lignin), or that obtained by hydrolysis of biomass (hydrolysis lignin).

The methods described in this document are based on those described in other publications^{[1][2]}. Although the principle is similar to that described in ISO 21437^[3] and other related methods^{[4][5][6]} for the determination of carbohydrates in pulp, the properties and end-use applications of lignin, as well as several steps in the testing procedure, including sampling, sample preparation, and others, are different from those of pulp.

Lignins — Determination of carbohydrate composition in kraft lignin, soda lignin and hydrolysis lignin

1 Scope

This document describes a method for the determination of carbohydrate composition in kraft lignin, soda lignin and biorefinery lignin.

The method is applicable to lignin isolated from a kraft pulping process, a soda pulping process, or lignin obtained by hydrolysis of biomass.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

lignins

class of complex organic macromolecules, containing aromatic sub-units, that play a key role in the formation of cell walls in wood and bark, conferring mechanical strength and rigidity to the cell walls and to plants as a whole

Note 1 to entry: Lignin is the main non-carbohydrate constituent of wood.

3.2

kraft lignin

depolymerized and chemically modified lignin isolated from a kraft pulping process, such as that originating from kraft black liquor

3.3

soda lignin

depolymerized and chemically modified lignin isolated from a soda pulping process, such as that originating from soda liquor

3.4

hydrolysis lignin

lignin produced for commercial applications by conversion of biomass, through enzymatic or acid hydrolysis, into sugars and lignin streams, followed by separation of the lignin fraction

3.5

biomass

biological material derived from living, or previously living organisms, such as wood, agricultural crops, and other plant-based biodegradable material