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**Nanotechnologies - Characterization of cellulose nanocrystals**

纳米技术 纤维素纳米晶的表征方法

**(English Translation)**

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## Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting:

This document is equivalent to ISO/T R19716:2016 "Characterization method of cellulose nanocrystals in nanotechnology": The file type is determined by ISO :

The technical report is adjusted to my country's national standards:

This document adds a chapter "Normative References":

Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents:

## Introduction

Cellulose nanomaterials, including cellulose nanocrystals and cellulose nanofibrils: Cellulose nanocrystals are produced through strong acid hydrolysis, chemical or enzymatic it is extracted from cellulose of trees and other plants by oxidation and other methods [1-3]: Cellulose nanocrystals as a new sustainable polymer nanomaterial Materials are mainly produced from sustainable resources such as wood pulp, and their mass production and related processing equipment have been continuously improved, increasing fiber Feasibility of commercial development of elemental nanocrystals: Cellulose nanocrystals and cellulose nanofibrils are produced in pilot, pre-commercial or commercial applications in some countries:

Produced on an industrial scale: Based on projected application areas and market penetration, global production of cellulose nanomaterials reaches 35 million units per year tons[4,5]: In order to qualify cellulose nanocrystals for commercial development and applications, characterization methods for cellulose nanocrystals need to be developed standard:

Cellulose nanocrystals have a high aspect ratio, high specific surface area and mechanical strength, and self-assemble into chiral structures with unique optical properties:

Nematic phase rod-shaped nanomaterials: They are smaller in length than cellulose nanofibrils but have higher crystallinity: Because of the above-mentioned properties, and can be dispersed in various matrices by regulating the surface charge and chemical properties of cellulose nanocrystals: Cellulose nanocrystals are used in many all fields have shown potential application value, including nanocomposites, coatings and adhesives, optical films and devices, rheology modifiers, catalysis agents and biomedical products, etc: This document describes sample preparation, data acquisition, and data analysis/interpretation relevant to the characterization of cellulose nanocrystals:

and other information, including the following properties: composition (crystallinity, surface functional groups and degree of polymerization), morphology, surface characteristics, viscosity and thermal stability, etc: It is expected that it plays an important role in the development of commercial products of cellulose nanocrystals: This document describes various methods used to characterize specific properties, but does not Standard methods are recommended or detailed information on these techniques is available: The scope of this document is limited to the production of cellulose nanocrystals and does not include post-production Modified cellulose nanocrystals or cellulose nanocrystal reinforced materials or products:

Characterization methods of nanotechnology cellulose nanocrystals

## 1 Scope

This document describes commonly used characterization methods for cellulose nanocrystals, including sample preparation, measurement methods and data analysis, covering applications for Some of the measurement indicators used to characterize commercially produced and applied cellulose nanocrystals, including composition, morphology, surface and other properties of cellulose nanocrystals:

## 2 Normative reference documents

This document has no normative references:

## 3 Terms and definitions

The following terms and definitions apply to this document:

agglomerate

The surface area of an accumulation, aggregate or mixture of weakly bound particles is similar to the sum of the surface areas of its individual particles:

**Note 1:** The forces supporting agglomerates are weak forces, such as van der Waals forces or

simple physical entanglements:

**Note 2:** Agglomerates are also called secondary particles, while source particles are called primary particles:

[Source: ISO/T S80004-2:2015,3:3] 3.2 aggregate New particles formed from particles that are strongly bound or fused together may have an external surface area that is significantly smaller than the sum of the surface areas of the individual particles:

**Note 1:** The forces supporting aggregates are all strong forces, such as covalent bonds or originating from sintering or complex physical entanglements:

**Note 2:** Aggregates are also called secondary particles, while source particles are called primary particles:

[Source: ISO/T S80004-2:2015,3:4] 3.3 nanocrystal Nanocrystals Nanoobjects with crystalline structures:

[Source: ISO/T S80004-2:2015,4:15] 3.4 nanofibre the external dimensions of the two dimensions are similar and at the nanometer scale, and the external dimensions of the remaining one dimension are significantly larger than those of the other two dimensions:

nanofibre object:

**Note 1:** The longest external dimension is not necessarily in the nanometer scale:

**Note 2:** The terms nanofibrils and nanofilaments can also be used:

nano-object an object with one, two or three dimensions whose external dimensions are on the nanometer scale:

**Note:** A general term used for all discrete nanoscale objects:

[Source: ISO/T S80004-2:2015,2:2]