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Nanotechnologies — Standard terms and their definition for cellulose nanomaterial

Termes normalisés et leur définition pour les nanomatériaux à base de cellulose

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Contents

Foreword

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Introduction

Cellulose is a polymer produced by nature. In plants, animals, algae and bacteria, cellulose is extruded from terminal enzyme complexes (TC). TCs are made up of many identical subunits, each containing at least one catalytic site from which a single cellulose chain is synthesized. Cellulose chains from a single TC combine to form an elementary fibril. As TCs in plants, animals, algae, and bacteria have different numbers and configurations of subunits, the elementary fibrils they produce have different geometries. [4] Whether cellulose nanomaterials are separated by industrial processes or produced directly by organisms, they all contain a common structural component, which is the elementary fibril. This common component, the elementary fibril, provides a way to describe cellulose nanomaterials from all manufacturing methods and cellulose sources.

In industrial productions, cellulose nanomaterials can be manufactured by conversion of wood pulp through chemical, biological or mechanical processes. In the case of bacterium-based cellulose nanomaterials, they are produced directly by bacteria and can be further acid-hydrolysed to smaller dimensions. Besides trees and bacteria, algae is another potential sources of cellulose nanomaterials for industrial applications. Due to their renewable nature and unique properties, cellulose nanomaterials have developed into platform materials that have application potential in a wide range of products including those that currently utilize petroleum-based ingredients.

In the current stage of development, several terms to describe cellulose nanomaterials coexist and have created confusion among users. Rather than delaying standards development until knowledge accumulated with market maturity is available, we have an opportunity to define a standard vocabulary for cellulose nanomaterials as they enter the market place. It is anticipated that as the market for cellulose nanomaterials matures, so too will the standard vocabulary. Beginning to define a standard vocabulary now will facilitate future communication, eliminate confusion, remove trade barriers and provide policy makers and regulators with a set of consensus-based terms.