Dr Mahendra Patel's new book, "Nanocellulose Production Technologies," was inaugurated at the Paper & Packaging Week on the 16th of October 2025 by Dr Devan Chamberlain, CEO of PITA in London.

Nanocellulose is one of the most fascinating research subjects currently in the scientific world because of its potential to replace materials based on fossil fuels. It is made from the abundantly available lignocellulosic materials, namely, the trees and crops. Moreover, it is biodegradable and biocompatible. This nano-dimensional material possesses strength as high as that of steel or carbon fibre and can impart superior properties to many materials such as transparency, surface area, thermal stability, having applications in pulp and paper, biomedical, food, cosmetics, textile, cement, electronics and in many other fields.

The process to produce nanocellulose consists of firstly extracting the cellulose in its purest and structurally stable form from the lignocellulosic plant materials and then converting it to nanoparticles of cellulose employing varying technologies, which is the main theme of this book.

Though nanocellulose has crossed the boundary from laboratory to industrial scale, refining and optimizing the present processes are exigent to reduce the cost of production and bring in improvement in many properties. Several technologies have been reported and a few of them have been upgraded to an industrial scale. The upgrade has been so swift that the gram level of production in the laboratory in the 2010s has now reached more than a thousand tons per year by some of the producers. This book assesses the different technologies available for nanocellulose production, which will give insights and boost the production figures further.

The pulp and paper industry plays an important role in the development of nanocellulose from plant materials, which are the same for paper manufacturing also, namely, hardwoods, softwoods, agro-residues and even recycled fibre. Moreover, the bleached pulp can be directly taken as the feedstock for nanocellulose production. Simultaneously, the paper industry should find out ways and strategies for increasing its application level in enhancing the properties of paper and packaging, notably strength, surface properties, rheology, porosity and especially the barrier properties. The paper industry can develop value-added products using nanocellulose, which can be used in highly specialized areas and thus it can enhance its financial position.

This book is devoted to the Technology part to produce Nanocellulose, elaborating on the existing plant-scale technologies and simultaneously assessing the developing techniques for industrial production.

While the major emphasis of this book is on industrial production, all other processes and techniques are supplemented by theoretical parts such as chemical reactions, kinetics, mechanisms with structural and morphological alterations during cellulose degradation along with the engineering know-how containing proper flow diagram, equipment and machinery required for production, each chapter concluded by an assessment report for amenability to industrial production

The contents are in eight sections with 31 chapters classified for Chemical, Mechanical, Biotechnological and Industrial production as follows:

Section I: Introduction and overview

A. Section II: Chemical treatments: Acid hydrolysis with sulphuric, hydrochloric, nitric and hydrobromic and organic acids.

Section III: Chemical treatments: Catalysts and Oxidants: Metal catalysts, TEMPO oxidation, Periodate and Ammonium persulphate oxidation.

Section IV: Chemical treatments: Green chemicals: Ionic liquids, Deep eutectic solvents, Subcritical water.

B. Section V: Mechanical treatments: Conventional: Homogenisation, Microfluidisation and Grinding techniques.
   Section VI: Nonconventional & Green technologies: Ball milling, Refiner, Cryo-crushing, Blending, Screw extrusion, Ultrasonication, Aqueous counter collision, Steam explosion and Ion exchange.
C. Section VII: Enzymatic and Radiation-based technologies: Enzymatic hydrolysis, Bacterial nanocellulose and Radiation-based techniques.
D. Section VIII: Industrial production