

The Global Market for Nanocellulose 2021

https://marketpublishers.com/r/GAE33F5310CEN.html

Date: September 2021

Pages: 395

Price: US\$ 1,505.00 (Single User License)

ID: GAE33F5310CEN

Abstracts

The global nanocellulose market has accelerated over the last few years as producers in Japan and to a lesser extent North America and Europe bring products to market. The development of these remarkable materials has compelled major paper and pulp producers to gravitate their traditional business towards advanced biorefineries, which have met with initial success and resulted in production capacity increases.

These bio-based materials are abundant, renewable and inexpensive but are extremely strong, durable, and lightweight, non-toxic and are lower cost than other advanced materials and nanomaterials. Used as a materials additive and in composites, nanocellulose will help to drive the global move away from oil-based plastics and products to sustainable, bio-based alternatives.

Nanocellulose (NC) can be derived from a multitude of abundant cellulosic biomass sources such as wood pulp, agricultural crops, organic waste, as well as from bacteria. Properties including high tensile strength, biocompatibility, and high aspect ratio make it attractive to a wide range of markets, from medical to construction to aerospace. As nanocellulose originates from renewable matter, its potential to replace petroleum-derived materials in films, coatings, composites, and packaging are particularly interesting in the wake of current political and societal movements towards reduction of plastic consumption.

Three types of NC are commercially available: cellulose nanocrystals (CNC), cellulose nanofibers (CNF), and bacterial nanocellulose (BNC). In addition to being produced in different ways, these three types also vary in their physico-chemical properties, from size to crystallinity. Most commercially produced NC is CNF, which is produced on a large scale in Japan and on the pilot scale

Most of the NC being developed for commercial purposes is in the form of CNF.



Currently, many NC-based applications are at an early stages, with some applications already commercially available, mainly in Japan.

The Global Market for Nanocellulose 2021 is the most comprehensive and up-to date report on nanocellulose currently available, by the world's leading market authority on nanocellulose. Profiling over 100 companies, the report provides key information for investors and executives to enable them to understand and take advantage of the opportunities provided by nanocellulose.

A must-have for anyone interested in the business and investment opportunities in nanocellulose, The Global Market for Nanocellulose 2021 contains:

Unique market assessment tools to assess the viability of nanocellulose, by market, and application.

Tabular data on current nanocellulose products.

Market assessment by nanocellulose type: cellulose nanocrystals (CNC), cellulose nanofibers (CNF), and bacterial nanocellulose (BNC).

Assessment of nanocellulose by market including applications, key benefits, market megatrends, market drivers for use of nanocellulose, technology drawbacks, competing materials, estimated consumption of nanocellulose to 2030 and main OEMs in each market with potential interest in nanocellulose for product integration.

Graphical depictions of nanocellulose applications by market.

In depth-assessment of nanocellulose producer and distributor pricing in 2020.

Global market for nanocellulose in tons, by sector, historical and forecast to 2030.

Market impact from COVID-19 pandemic

In-depth profiles of nanocellulose producers including products, production capacities, manufacturing methods, collaborations, licensing, customers and target markets. Companies profiled include Granbio, Asahi Kasei, Cellucomp, Chuetsu Pulp & Paper, Daio Paper, DKS, Fiberlean, Fuji Pigment Co., Ltd.



Innventia AB, KRI, Inc., Melodea, Nippon Paper, Oji and many more.

90 cellulose nanofiber company profiles

16 cellulose nanocrystal company profiles

11 bacterial nanocellulose company profiles

Detailed forecasts for key growth areas, opportunities and demand.

Excel database of nanocellulose products.

Excel database of nanocellulose prices.



Contents

1 EXECUTIVE SUMMARY

- 1.1 Why nanocellulose?
- 1.2 The market for nanocellulose
- 1.3 Future global market outlook
- 1.4 Global nanocellulose production
 - 1.4.1 Total global production capacity 2021, by type
 - 1.4.2 Cellulose nanofibers (CNF) production capacities 2021, by producer
 - 1.4.3 Microfibrillated cellulose (MFC) production capacities 2021
 - 1.4.4 Cellulose nanocrystals (CNC) production capacities 2021
- 1.5 Market challenges for nanocellulose
- 1.6 Nanocellulose commercial products
- 1.7 Nanocellulose market by region
 - 1.7.1 Japan
 - 1.7.2 China
 - 1.7.3 Malaysia
 - 1.7.4 Western Europe
 - 1.7.5 North America
- 1.8 Global government funding
- 1.9 Market impact from COVID-19 pandemic

2 OVERVIEW OF NANOCELLULOSE

- 2.1 Cellulose
- 2.2 Nanocellulose
- 2.3 Properties of nanocellulose
- 2.4 Advantages of nanocellulose
- 2.5 Manufacture of nanocellulose
- 2.6 Production methods
- 2.7 Types of nanocellulose
 - 2.7.1 Microfibrillated cellulose (MFC)
 - 2.7.2 Cellulose nanofibers (CNF)
 - 2.7.2.1 Applications
 - 2.7.3 Cellulose nanocrystals (CNC)
 - 2.7.3.1 Synthesis
 - 2.7.3.2 Properties
 - 2.7.3.3 Applications



- 2.7.4 Bacterial Nanocellulose (BNC)
 - 2.7.4.1 Applications
- 2.8 Synthesis

3 APPLICATIONS ANALYSIS

4 REGULATIONS AND STANDARDS

- 4.1 Standards
 - 4.1.1 International Standards Organization (ISO)
 - 4.1.2 American National Standards
 - 4.1.3 CSA Group
- 4.2 Toxicity
- 4.3 Regulation

5 NANOCELLULOSE SUPPLY CHAIN

6 NANOCELLULOSE PRICING

- 6.1 Cellulose nanofiber (CNF)
- 6.2 Cellulose nanocrystal (CNC)
- 6.3 Bacterial nanocellulose (BNC)

7 NANOCELLULOSE PATENTS AND PUBLICATIONS

8 NANOCELLULOSE IN COMPOSITES

- 8.1 Market overview
- 8.2 Market prospects
- 8.3 Market assessment
- 8.4 Applications
- 8.5 Global market in tons, historical and forecast to 2030
- 8.6 Product developer profiles

9 NANOCELLULOSE IN AUTOMOTIVE

- 9.1 Market overview
- 9.2 Market prospects
- 9.3 Market assessment



- 9.4 Applications
- 9.5 Global market in tons, historical and forecast to 2030
- 9.6 Product developer profiles

10 NANOCELLULOSE IN CONSTRUCTION

- 10.1 Market overview
- 10.2 Market prospects
- 10.3 Market assessment
- 10.4 Applications
- 10.5 Global market in tons, historical and forecast to 2030
- 10.6 Product developer profiles

11 NANOCELLULOSE IN PAPER AND BOARD PACKAGING

- 11.1 Market prospects
- 11.2 Market assessment
- 11.3 Applications
- 11.4 Global market in tons, historical and forecast to 2030
- 11.5 Product developer profiles

12 NANOCELLULOSE TEXTILES AND APPAREL

- 12.1 Market overview
- 12.2 Market prospects
- 12.3 Market assessment
- 12.4 Applications
- 12.5 Global market in tons, historical and forecast to 2030
- 12.6 Product developer profiles

13 NANOCELLULOSE IN MEDICINE AND HEALTHCARE

- 13.1 Market overview
- 13.2 Market prospects
- 13.3 Market assessment
- 13.4 Applications
- 13.5 Global market in tons, historical and forecast to 2030
- 13.6 Product developer profiles



14 NANOCELLULOSE IN PAINTS AND COATINGS

- 14.1 Market overview
- 14.2 Market prospects
- 14.3 Market assessment
- 14.4 Applications
- 14.5 Global market in tons, historical and forecast to 2030
- 14.6 Product developer profiles

15 NANOCELLULOSE IN AEROGELS

- 15.1 Market overview
- 15.2 Market prospects
- 15.3 Market assessment
- 15.4 Global market in tons, historical and forecast to 2030
- 15.5 Product developer profiles

16 NANOCELLULOSE IN OIL AND GAS

- 16.1 Market overview
- 16.2 Market prospects
- 16.3 Market assessment
- 16.4 Global market in tons, historical and forecast to 2030
- 16.5 Product developer profiles

17 NANOCELLULOSE IN FILTRATION

- 17.1 Market overview
- 17.2 Market prospects
- 17.3 Market assessment
- 17.4 Application
- 17.5 Global market in tons, historical and forecast to 2030
- 17.6 Product developer profiles

18 NANOCELLULOSE IN RHEOLOGY MODIFIERS FOR COSMETICS, PHARMA AND FOOD ADDITIVES

- 18.1 Market overview
- 18.2 Market prospects



- 18.3 Market assessment
- 18.4 Applications map
- 18.5 Global market in tons, historical and forecast to 2030
- 18.6 Product developer profiles

19 OTHER MARKETS FOR NANOCELLULOSE

- 19.1 PRINTED, STRETCHABLE AND FLEXIBLE ELECTRONICS
 - 19.1.1 Market assessment
 - 19.1.2 Product developer profiles
- 19.2 NANOCELLULOSE IN 3D PRINTING
 - 19.2.1 Market assessment
 - 19.2.2 Product developer profiles
- 19.3 NANOCELLULOSE IN AEROSPACE
 - 19.3.1 Market assessment
 - 19.3.2 Product developer profiles

20 NANOCELLULOSE PRODUCER ANALYSIS

- 20.1 Types of nanocellulose produced, by producer
- 20.2 Target markets, by nanocellulose producer

21 CELLULOSE NANOFIBER COMPANY PROFILES

- 21.1 Aichemist Metal Inc.
- 21.2 ANPOLY, Inc.
- 21.3 Asahi Kasei Corporation
- 21.4 Betulium Oy
- 21.5 BIO-LUTIONS International AG
- 21.6 Blue BioFuels, Inc.
- 21.7 Borregaard ChemCell
- 21.8 CELLICON B.V.
- 21.9 Cellucomp Ltd.
- 21.10 Cellutech AB (Stora Enso)
- 21.11 Centre Technique du Papier (CTP)
- 21.12 Chuetsu Pulp & Paper Co., Ltd.
- 21.13 Daicel Corporation
- 21.14 DaikyoNishikawa Corporation
- 21.15 Daio Paper Corporation



- 21.16 Daishowa Paper Products Co. Ltd.
- 21.17 Denso Corporation
- 21.18 DIC
- 21.19 DKS Co. Ltd.
- 21.20 Ehime Paper Manufacturing Co. Ltd.
- 21.21 Evolgene Genomics SL
- 21.22 Fiberlean Technologies
- 21.23 Fillerbank Limited
- 21.24 FineCell Sweden AB
- 21.25 Fuji Pigment Co., Ltd.
- 21.26 Furukawa Electric Co., Ltd
- 21.27 Granbio Technologies
- 21.28 GS Alliance Co. Ltd.
- 21.29 Hattori Shoten K.K.
- 21.30 Hexa Chemical Co. Ltd./Nature Gift
- 21.31 Hokuetsu Toyo Fibre Co., Ltd.
- 21.32 Innventia AB
- 21.33 The Japan Steel Works Ltd
- 21.34 JeNaCell GmbH
- 21.35 Kami Shoji Company
- 21.36 Kao Corporation
- 21.37 KRI, Inc.
- 21.38 Kruger Biomaterials, Inc.
- 21.39 Kusano Sakko K.K.
- 21.40 Maniwa Biochemical
- 21.41 Marine Nanofiber Co., Ltd.
- 21.42 Marusumi Paper Company Limited
- 21.43 Masuko Sangyo Co., Ltd.
- 21.44 Mitsubishi Chemical Corporation/Mitsubishi Paper Mills Limited
- 21.45 Mori Machinery Co., Ltd.
- 21.46 Natural Friend
- 21.47 Nippon Paper Group, Inc.
- 21.48 Nippon Shizai Co., Ltd
- 21.49 Nissin Kogyo Co., Ltd.
- 21.50 Norske Skog ASA
- 21.51 Omura Paint Co., Ltd.
- 21.52 Onkyo Corporation
- 21.53 Oji Holdings Corporation
- 21.54 Osaka Gas Group



- 21.55 Performance BioFilaments Inc
- 21.56 Rengo Co., Ltd.
- 21.57 Ripro Corporation
- 21.58 Risho Kogyo Co. Ltd.
- 21.59 Sanwa Kako Co. Ltd
- 21.60 Sappi Limited
- 21.61 Seiko PMC Corporation
- 21.62 Sharp Chemical Ind. Co., Ltd.
- 21.63 Shinwa Kako KK
- 21.64 Starlite Co., Ltd.
- 21.65 Stora Enso Oyj
- 21.66 Sugino Machine Limited
- 21.67 Svilosa AD
- 21.68 Taiyo Holdings Co Ltd
- 21.69 Tianjon Haojia Cellulose Co., Ltd.
- 21.70 Tentok Paper Co. Ltd.
- 21.71 Toagosei Co. Ltd.
- 21.72 Tokushu Tokai Paper Co., Ltd.
- 21.73 Toray Industries, Inc.
- 21.74 Toppan Printing Co., Ltd.
- 21.75 Toyota Boshoku Corporation
- 21.76 TS TS Tech Co., Ltd.
- 21.77 Ube Industries, Ltd.
- 21.78 Unitika Co., Ltd.
- 21.79 University of Maine Process Development Center
- 21.80 UPM-Kymmene Corporation
- 21.81 US Forest Products Laboratory (FPL)
- 21.82 Valmet OYJ
- 21.83 Verso Corporation
- 21.84 VTT Technical Research Centre of Finland Ltd
- 21.85 Yokohama Bio Frontier, Inc.
- 21.86 Yokohama Rubber Co. Ltd.
- 21.87 Yoshikawakuni Plastics Industries Co., Ltd.
- 21.88 Zelfo Technology GmbH

22 CELLULOSE NANOCRYSTAL (CNC) PRODUCER ANALYSIS

23 CELLULOSE NANOCRYSTAL (CNC) COMPANY PROFILES



- 23.1 Alberta Innovates/Innotech Materials LLC
- 23.2 Anomera, Inc.
- 23.3 Blue Goose Biorefineries (BGB) Inc.
- 23.4 CELLICON B.V.
- 23.5 Celluforce, Inc.
- 23.6 Evolgene Genomics SL
- 23.7 Guilin Qihong Technology
- 23.8 Melodea Ltd.
- 23.9 Navitas d.o.o (NANOCRYSTACELL)
- 23.10 Poly-Ink
- 23.11 Renmatix, Inc.
- 23.12 Sweetwater Energy
- 23.13 Tianjin Woodelfbio Cellulose Co., Ltd.
- 23.14 UMaine Process Development Center
- 23.15 Forest Products Laboratory (FPL)
- 23.16 Valentis Nanotech

24 BACTERIAL CELLULOSE (BC) COMPANY PROFILES

- 24.1 Axcelon Biopolymers Corporation
- 24.2 Azolla
- 24.3 Bowil Biotech Sp. z o.o.
- 24.4 Bucha Bio, Inc.
- 24.5 Cass Materials Pty Ltd
- 24.6 Cellugy
- 24.7 DePuy Synthes
- 24.8 FZMB GmbH
- 24.9 Kusano Sakko Inc.
- 24.10 Lohmann & Rauscher International GmbH & Co KG
- 24.11 Nanollose Ltd
- 24.12 Nano Novin Polymer Co

25 NANOCELLULOSE RESEARCH GROUPS AND CENTRES

- 25.1 Aalto University
- 25.2 AIST
- 25.3 Clark-Atlanta University
- 25.4 Colorado School of Mines
- 25.5 EMPA



- 25.6 Georgia Institute of Technology
- 25.7 Grenoble INP-Pagora
- 25.8 ICAR-Central Institute for Research on Cotton Technology
- 25.9 Kanazawa Institute of Technology
- 25.10 Kyoto University
- 25.11 McMaster University
- 25.12 Monash University
- 25.13 North Carolina State University
- 25.14 Oregon State University
- 25.15 Paper and Fiber Research Institute (PFI)
- 25.16 Pennsylvania State University
- 25.17 Purdue University
- 25.18 SUNY-ESF
- 25.19 Technical University of Lodz
- 25.20 Toyama Industrial Technology Center
- 25.21 University of Exeter
- 25.22 University of Fribourg
- 25.23 Uppsala University
- 25.24 Universidade do Minho
- 25.25 University of Natural Resources and Life Sciences (Boku University)
- 25.26 University of Toronto
- 25.27 Other research centres/groups

26 RESEARCH SCOPE AND METHODOLOGY

- 26.1 Report scope
- 26.2 Research methodology

27 REFERENCES



Tables

TABLES

- Table 1. Market summary for nanocellulose-Selling grade particle diameter, usage, advantages, average price/ton, market estimates, global consumption, main current applications, future applications.
- Table 2. Markets and applications for nanocellulose.
- Table 3. Classification of nanocellulose applications by type of industrial product ranged in terms of their potential of consumption.
- Table 4. Market segmentation by type of nanocellulose, capacities and demand 2020, metric tonnes.
- Table 5. CNF production capacities (by type, wet or dry) and production process, by producer, metric tonnes.
- Table 6: MFC production capacities (by type, wet or dry) and production process, by producer, metric tonnes.
- Table 7. Global demand for cellulose nanofibers/MFC by market in metric tonnes, 2018-2031.
- Table 8: Cellulose nanocrystal capacities (by type, wet or dry) and production process, by producer, metric tonnes.
- Table 9. Global demand for cellulose nanofibers/MFC by market in metric tonnes, 2018-2031.
- Table 10: Global demand for cellulose nanocrystals by market, 2018-2030.
- Table 11: Market and technical challenges in nanocellulose.
- Table 12: Regional demand for cellulose nanofibers, 2019, tons (total excludes MFC).
- Table 13. Nanocellulose producers and product developers in Japan.
- Table 14. Nanocellulose research centres, universities and companies in China.
- Table 15. Nanocellulose producers and product developers in Europe.
- Table 16. Nanocellulose producers and product developers in North America.
- Table 17. Assessment of impact from COVID-19 by end user market. Key: Low, little impact and market will continue to grow. Medium, market impacted to some degree affecting growth prospects over next 1-2 years. High: Market significantly impacted.
- Table 18. Properties and applications of nanocellulose.
- Table 19. Properties of nanocellulose, by type.
- Table 20: Properties of cellulose nanofibrils relative to metallic and polymeric materials.
- Table 21. Types of nanocellulose.
- Table 22: Types of nanocellulose.
- Table 23: Applications of cellulose nanofibers (CNF).
- Table 24. Synthesis methods for cellulose nanocrystals (CNC).



- Table 25: CNC sources, size and yield.
- Table 26: CNC properties.
- Table 27. Mechanical properties of CNC and other reinforcement materials.
- Table 28: Applications of nanocrystalline cellulose (NCC).
- Table 29: Applications of bacterial nanocellulose (BNC).
- Table 30. Market opportunity assessment for nanocellulose, by application.
- Table 31: Safety of Micro/Nanofibrillated cellulose.
- Table 32: Global nanocellulose market supply chain analysis.
- Table 33: Product/price/application matrix of cellulose nanofiber producers.
- Table 34: Product/price/application matrix of cellulose nanocrystal producers.
- Table 35: Product/price/application matrix of bacterial nanocellulose producers.
- Table 36: Nanocellulose patents and scientific articles by organisation.
- Table 37: Main patent assignees for CNC.
- Table 38: Main patent assignees for CNF.
- Table 39: Main patent assignees for NCC.
- Table 40. Market overview for nanocellulose in composites.
- Table 41. Comparative properties of polymer composites reinforcing materials.
- Table 42. Scorecard for nanocellulose in composites.
- Table 43. Market assessment for nanocellulose in composites-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global composites OEMs.
- Table 44: Global market demand for nanocellulose in composites, 2018-2030 (tons).
- Table 45: Companies developing nanocellulose composites.
- Table 46. Market overview for nanocellulose in automotive.
- Table 47. Scorecard for nanocellulose in automotive.
- Table 48. Market assessment for nanocellulose in automotive-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global automotive OEMs.
- Table 49: Global market demand for nanocellulose in the automotive sector 2018-2030 (tons).
- Table 50: Companies developing nanocellulose products in the automotive industry.
- Table 51. Market overview for nanocellulose in construction.
- Table 52. Scorecard for nanocellulose in construction
- Table 53. Comparison of CNC with steel and other materials.
- Table 54. Market assessment for nanocellulose in construction-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global construction OEMs
- Table 55: Market demand for nanocellulose in construction, 2018-2030 (tons).
- Table 56: Companies developing nanocellulose in construction.



- Table 57. Oxygen permeability of nanocellulose films compared to those made form commercially available petroleum-based materials and other polymers.
- Table 58. Scorecard for nanocellulose in paper and board packaging.
- Table 59. Market assessment for nanocellulose in paper and board packaging-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global paper and board packaging OEMs.
- Table 60: Global demand for nanocellulose in paper & board packaging, 2018-2030 (tons).
- Table 61: Companies developing nanocellulose products in paper and board.
- Table 62. Market overview for nanocellulose in textiles and apparel.
- Table 63. Scorecard for nanocellulose in textiles and apparel.
- Table 64. Market assessment for nanocellulose in textiles and apparel-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global textiles and apparel OEMs.
- Table 65: Demand for nanocellulose in textiles, 2018-2030 (tons).
- Table 66: Companies developing nanocellulose products in textiles and apparel.
- Table 67. Market overview for nanocellulose in medicine and healthcare.
- Table 68. Scorecard for nanocellulose in medicine and healthcare.
- Table 69. Market assessment for nanocellulose in medicine and healthcare-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global medicine and healthcare OEMs.
- Table 70: Global demand for nanocellulose in medical and healthcare, 2018-2030 (tons).
- Table 71: Global demand for nanocellulose in hygiene and absorbents, 2018-2030 (tons).
- Table 72: Nanocellulose product developers in medicine and healthcare.
- Table 73. Market overview for nanocellulose in paints and coatings.
- Table 74. Scorecard for nanocellulose in paints and coatings.
- Table 75. Market assessment for nanocellulose in paints and coatings-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global paints and coatings OEMs.
- Table 76: Global demand for nanocellulose in paint and coatings, 2018-2030 (tons).
- Table 77: Companies developing nanocellulose products in paints and coatings, applications targeted and stage of commercialization.
- Table 78. Market overview for nanocellulose in aerogels.
- Table 79. Scorecard for nanocellulose in aerogels.
- Table 80. Market assessment for nanocellulose in aerogels and insulation-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks,



competing materials, material loading, main global aerogels OEMs.

Table 81: Global demand for nanocellulose in aerogels and insulation, 2018-2030 (tons).

Table 82: Nanocellulose product developers in aerogels and insulation.

Table 83. Market overview for nanocellulose in oil and gas.

Table 84. Scorecard for nanocellulose in oil and gas.

Table 85. Market assessment for nanocellulose in oil and gas-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global oil and gas OEMs.

Table 86: Global demand for nanocellulose in the oil and gas market, 2018-2030 (tons).

Table 87: Nanocellulose product developers in oil and gas exploration.

Table 88. CNF membranes.

Table 89. Market overview for nanocellulose in filtration.

Table 90. Scorecard for nanocellulose in filtration.

Table 91. Market assessment for nanocellulose in filtration-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global filtration OEMs.

Table 92: Global demand for nanocellulose in the filtration market, 2018-2030 (tons).

Table 93: Companies developing nanocellulose products in filtration.

Table 94. Market overview for nanocellulose in rheology modifiers.

Table 95. Scorecard for nanocellulose in rheology modifiers.

Table 96. Market assessment for nanocellulose in rheology modifiers-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global rheology modifier OEMs.

Table 97: Global demand for nanocellulose in the rheology modifiers market, 2018-2030 (tons).

Table 98: Commercial activity in nanocellulose rheology modifiers.

Table 99. Properties of flexible electronics?cellulose nanofiber film (nanopaper).

Table 100. Market assessment for nanocellulose in printed, stretchable and flexible electronics-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global printed, flexible and stretchable electronics OEMs.

Table 101: Companies developing cellulose nanofiber products in printed, stretchable and flexible electronics.

Table 102. Market assessment for nanocellulose in 3D priniting-application, key benefits and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global 3D printing OEMs.

Table 103: Companies developing nanocellulose 3D printing products.

Table 104. Market assessment for nanocellulose in aerospace-application, key benefits



and motivation for use, megatrends, market drivers, technology drawbacks, competing materials, material loading, main global aerospace OEMs.

Table 105: Companies developing nanocellulose products in aircraft and aerospace.

Table 106: Nanocellulose producers and types of nanocellulose produced.

Table 107: Target markets, by nanocellulose producer.

Table 108: Granbio Nanocellulose Processes.

Table 109: Oji Holdings CNF products.

Table 110: CNC producers and production capacities.

Table 111: Target market, by cellulose nanocrystal producer.

Table 112. Fibnano properties.



Figures

FIGURES

- Figure 1. Nanocellulose market in 2020-21-industry product and production activity.
- Figure 2. Market segmentation by type of nanocellulose, capacities and demand 2021, metric tonnes.
- Figure 3. Global demand for cellulose nanofibers/MFC in metric tonnes by market, 2018-2031.
- Figure 4. Global demand for cellulose nanocrystals by market, 2018-2031.
- Figure 5. Global demand for cellulose nanofibers/MFC in metric tonnes by market, 2018-2031.
- Figure 6: Global demand for cellulose nanocrystals by market, 2018-2031.
- Figure 7: Nanocellulose-based commercial products.
- Figure 8. Dorayaki.
- Figure 9. ENASAVE NEXT.
- Figure 10. GEL-KAYANO™.
- Figure 11. Kirekira! toilet wipes.
- Figure 12. 'Poise' series Super strong deodorant sheet.
- Figure 13. SC-3 (B) speakers.
- Figure 14. SE-MONITOR5 headphones.
- Figure 15. 'Skin Care Acty' series Adult diapers.
- Figure 16. 'SURISURI' Lotion.
- Figure 17: Regional demand for cellulose nanofibers, 2020.
- Figure 18: Schematic diagram of partial molecular structure of cellulose chain with numbering for carbon atoms and n= number of cellulose repeating unit.
- Figure 19: Scale of cellulose materials.
- Figure 20: Types of nanocellulose.
- Figure 21: Relationship between different kinds of nanocelluloses.
- Figure 22: CNF gel.
- Figure 23. TEM image of cellulose nanocrystals.
- Figure 24. CNC preparation.
- Figure 25: Extracting CNC from trees.
- Figure 26: CNC slurry.
- Figure 27. Nanocellulose preparation methods and resulting materials.
- Figure 28. Various preparation methods for nanocellulose.
- Figure 29: (a) Number of research publications on the different nomenclatures of nanocellulosic materials per year during the last decade. (b) Cumulative number of research article number published per nomenclature.



- Figure 30. Published patent publications for nanocellulose, 2009-2018.
- Figure 31: Nanocellulose patents by field of application.
- Figure 32. Applications of nanocellulose in composites.
- Figure 33: Global market demand for nanocellulose in composites, 2018-2030 (tons).
- Figure 34. CNF mixed PLA (Poly Lactic Acid).
- Figure 35: CNF resin products.
- Figure 36. Interior of NCV concept car.
- Figure 37. Applications of nanocellulose in automotive.
- Figure 38: Global demand for nanocellulose in the automotive sector, 2018-2030 (tons).
- Figure 39: Daio Paper's cellulose nanofiber material in doors and hood of race car.
- Figure 40: CNF composite.
- Figure 41: Engine cover utilizing Kao CNF composite resins.
- Figure 42. The structure of the CNF-based front hood.
- Figure 43. CNF car engine cover developed in Japan Ministry of the Environment's
- (MOE) Nano Cellulose Vehicle (NCV) Project.
- Figure 44. Comparison of nanofillers with supplementary cementitious materials and aggregates in concrete.
- Figure 45. Applications of nanocellulose in construction.
- Figure 46: Demand for nanocellulose in construction, 2018-2030 (tons).
- Figure 47. Applications of nanocellulose in paper and board packaging.
- Figure 48: Global demand for nanocellulose in the paper & board/packaging, 2018-2030 (tons).
- Figure 49. Applications of nanocellulose in textiles and apparel.
- Figure 50: Demand for nanocellulose in the textiles, 2018-2030 (tons).
- Figure 51: CNF deodorant products.
- Figure 52. Applications of nanocellulose in medicine and healthcare.
- Figure 53: Global demand for nanocellulose in medical and healthcare, 2018-2030 (tons).
- Figure 54: Global demand for nanocellulose in hygiene and absorbents 2018-2030 (tons).
- Figure 55. Fibnano.
- Figure 56. Applications of nanocellulose in paints and coatings.
- Figure 57: Global demand for nanocellulose in paint and coatings, 2018-2030 (tons).
- Figure 58. Hefcel-coated wood (left) and untreated wood (right) after 30 seconds flame test.
- Figure 59: Global demand for nanocellulose in aerogels and insulation, 2018-2030 (tons).
- Figure 60: Global demand for nanocellulose in the oil and gas market, 2018-2030 (tons).



- Figure 61. Nanocellulose sponge developed by EMPA for potential applications in oil recovery.
- Figure 62. Applications of nanocellulose in filtration.
- Figure 63: Global demand for nanocellulose in the filtration market, 2018-2030 (tons).
- Figure 64. Multi-layered cross section of CNF-nw.
- Figure 65. Applications of nanocellulose in rheology modifers.
- Figure 66: Global demand for nanocellulose in the rheology modifiers market,
- 2018-2030 (tons).
- Figure 67. 'SURISURI' products.
- Figure 68: Foldable nanopaper antenna.
- Figure 69: Flexible electronic substrate made from CNF.
- Figure 70. Oji CNF transparent sheets.
- Figure 71. Electronic components using NFC as insulating materials.
- Figure 72: Anpoly cellulose nanofiber hydrogel.
- Figure 73. MEDICELLU™.
- Figure 74: Ashai Kasei CNF production process.
- Figure 75: Asahi Kasei CNF fabric sheet.
- Figure 76: Properties of Asahi Kasei cellulose nanofiber nonwoven fabric.
- Figure 77. CNF nonwoven fabric.
- Figure 78. Borregaard Chemcell CNF production process.
- Figure 79. nanoforest products.
- Figure 80. Chuetsu Pulp & Paper CNF production process.
- Figure 81. nanoforest-S.
- Figure 82. nanoforest-PDP.
- Figure 83. nanoforest-MB.
- Figure 84. Daicel Corporation CNF production process.
- Figure 85. Celish.
- Figure 86: Trunk lid incorporating CNF.
- Figure 87. Daio Paper CNF production process.
- Figure 88. ELLEX products.
- Figure 89. CNF-reinforced PP compounds.
- Figure 90. Kirekira! toilet wipes.
- Figure 91. Color CNF.
- Figure 92. DIC Products CNF production process.
- Figure 93. DKS Co. Ltd. CNF production process.
- Figure 94: Rheocrysta spray.
- Figure 95. DKS CNF products.
- Figure 96: CNF based on citrus peel.
- Figure 97. Citrus cellulose nanofiber.



- Figure 98. Imerys CNF production process.
- Figure 99. Filler Bank CNC products.
- Figure 100: Cellulose Nanofiber (CNF) composite with polyethylene (PE).
- Figure 101: CNF products from Furukawa Electric.
- Figure 102. Granbio CNF production process.
- Figure 103: Cutlery samples (spoon, knife, fork) made of nano cellulose and
- biodegradable plastic composite materials.
- Figure 104. Non-aqueous CNF dispersion 'Senaf' (Photo shows 5% of plasticizer).
- Figure 105: CNF gel.
- Figure 106: Block nanocellulose material.
- Figure 107: CNF products developed by Hokuetsu.
- Figure 108. Innventia CNF production process.
- Figure 109: Innventia AB movable nanocellulose demo plant.
- Figure 110. Kami Shoji CNF products.
- Figure 111. Dual Graft System.
- Figure 112: Engine cover utilizing Kao CNF composite resins.
- Figure 113. Acrylic resin blended with modified CNF (fluid) and its molded product (transparent film), and image obtained with AFM (CNF 10wt% blended).
- Figure 114: 0.3% aqueous dispersion of sulfated esterified CNF and dried transparent film (front side).
- Figure 115. Kruger Biomaterials, Inc. CNF production process.
- Figure 116. CNF deodorant.
- Figure 117. Chitin nanofiber product.
- Figure 118. Marusumi Paper cellulose nanofiber products.
- Figure 119. FibriMa cellulose nanofiber powder.
- Figure 120. Cellulomix production process.
- Figure 121. Nanobase versus conventional products.
- Figure 122. Uni-ball Signo UMN-307.
- Figure 123: CNF slurries.
- Figure 124. Range of CNF products.
- Figure 125: Nanocell serum product.
- Figure 126: Hydrophobization facilities for raw pulp.
- Figure 127: Mixing facilities for CNF-reinforced plastic.
- Figure 128. Nippon Paper CNF production process.
- Figure 129: Nippon Paper Industries' adult diapers.
- Figure 130. All-resin forceps incorporating CNF.
- Figure 131. CNF paint product.
- Figure 132: CNF wet powder.
- Figure 133: CNF transparent film.



- Figure 134: Transparent CNF sheets.
- Figure 135. Oji Paper CNF production process.
- Figure 136: CNF clear sheets.
- Figure 137. Oji Holdings CNF polycarbonate product.
- Figure 138: Fluorene cellulose ® powder.
- Figure 139. Performance Biofilaments CNF production process.
- Figure 140: XCNF.
- Figure 141: CNF insulation flat plates.
- Figure 142. Seiko PMC CNF production process.
- Figure 143. Manufacturing process for STARCEL.
- Figure 144: Rubber soles incorporating CNF.
- Figure 145. CNF dispersion and powder from Starlite.
- Figure 146. Stora Enso CNF production process.
- Figure 147. Sugino Machine CNF production process.
- Figure 148: High Pressure Water Jet Process.
- Figure 149: 2 wt.? CNF suspension.
- Figure 150. BiNFi-s Dry Powder.
- Figure 151. BiNFi-s Dry Powder and Propylene (PP) Complex Pellet.
- Figure 152: Silk nanofiber (right) and cocoon of raw material.
- Figure 153: SVILOSA AD CNC products.
- Figure 154: Silver / CNF composite dispersions.
- Figure 155: CNF/nanosilver powder.
- Figure 156: Comparison of weight reduction effect using CNF.
- Figure 157: CNF resin products.
- Figure 158. University of Maine CNF production process.
- Figure 159. UPM-Kymmene CNF production process.
- Figure 160. FibDex® wound dressing.
- Figure 161. US Forest Service Products Laboratory CNF production process.
- Figure 162: Flexible electronic substrate made from CNF.
- Figure 163. VTT 100% bio-based stand-up pouches.
- Figure 164. VTT CNF production process.
- Figure 165: HefCel-coated wood (left) and untreated wood (right) after 30 seconds
- flame test.
- Figure 166: Bio-based barrier bags prepared from Tempo-CNF coated bio-HDPE film.
- Figure 167. S-CNF in powder form.
- Figure 168. Zelfo Technology GmbH CNF production process.
- Figure 169: R3TM process technology.
- Figure 170: Blue Goose CNC Production Process.
- Figure 171: NCCTM Process.



Figure 172: Celluforce production process.

Figure 173: CNC produced at Tech Futures' pilot plant; cloudy suspension (1 wt.%), gel-

like (10 wt.%), flake-like crystals, and very fine powder. Product advantages include:

Figure 174: Plantrose process.

Figure 175. CNC solution.

Figure 176. University of Maine CNF production process.

Figure 177. US Forest Service Products Laboratory CNF production process.

Figure 178. Cellugy materials.

Figure 179: Bacterial cellulose face mask sheet.



I would like to order

Product name: The Global Market for Nanocellulose 2021

Product link: https://marketpublishers.com/r/GAE33F5310CEN.html

Price: US\$ 1,505.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer

Service:

info@marketpublishers.com

Payment

First name:

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page https://marketpublishers.com/r/GAE33F5310CEN.html

To pay by Wire Transfer, please, fill in your contact details in the form below:

Last name:		
Email:		
Company:		
Address:		
City:		
Zip code:		
Country:		
Tel:		
Fax:		
Your message:		
	**All fields are required	
	Custumer signature	

Please, note that by ordering from marketpublishers.com you are agreeing to our Terms & Conditions at https://marketpublishers.com/docs/terms.html

To place an order via fax simply print this form, fill in the information below and fax the completed form to +44 20 7900 3970