

Nanocellulose for Sustainable Future Materials

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In recent years, nanocellulose (NC) has emerged as a versatile and sustainable material with unique characteristics, derived from the common and abundant natural polymer, cellulose. This presentation examines the evolving landscape of NC, exploring its extraction processes, mechanical properties, and applications beyond conventional cellulose usage. The hierarchical structure of cellulose allows for the extraction of nanoparticles, offering properties like excellent mechanical strength, low density, biodegradability, and a substantial surface area. With a Young's modulus in the range of 100–130 GPa, NC presents promising properties for a wide range of applications, from eco-friendly materials in nanocomposites, reinforcing agents in packaging, and bioactive implants in medical devices. The presentation also distinguishes between cellulose "microfiber" and "nanofiber" and provides insights into potential applications, reinforcing NC's role as a transformative material in the sustainable materials and nanocomposites domain. This analysis encompasses recent advances in NC preparation, modification, and emerging applications, highlighting the breadth of possibilities for this green material, including its utilization in nanocomposites, wood adhesives, wastewater treatment, and novel biomedical applications, while also addressing the challenges and opportunities in the realm of emerging NC-based materials.

Biography:

R.A. Ilyas is a senior lecturer in the Faculty of Chemical and Energy Engineering, Universiti Teknologi Malaysia, Malaysia. He is also a Fellow of International Association of Advanced Materials (IAAM), Sweden, Fellow of International Society for Development and Sustainability (ISDS), Japan, a member of Royal Society of Chemistry, UK and Institute of Chemical Engineers (IChemE), UK, Chair of Science Outreach for Young Scientists Network - Academy of Sciences Malaysia (YSN-ASM) 2023. He received his Diploma in Forestry at Universiti Putra Malaysia, Bintulu Campus (UPMKB), Sarawak, Malaysia from Mei 2009 to April 2012. In 2012, he was awarded the Public Service Department (JPA) scholarship to pursue his Bachelor's Degree (BSc) in Chemical Engineering at Universiti Putra Malaysia (UPM). Upon completing his BSc. programme in 2016, he was again awarded the Graduate Research Fellowship (GRF) by the Universiti Putra Malaysia (UPM) to undertake a Ph.D. degree in the field of Biocomposite Technology & Design at the Institute of Tropical Forestry and Forest Products (INTROP) UPM. R.A. Ilyas was the recipient of the MVP Doctor of Philosophy Gold Medal Award UPM 2019, for Best Ph.D. Thesis and Top Student Award, INTROP, UPM. He was awarded with Outstanding Reviewer by Carbohydrate Polymers, Elsevier United Kingdom, Top Cited Article 2020-2021 Journal Polymer Composite, Wiley, 2022, and Best Paper Award at various International Conferences. R.A. Ilyas also was listed and awarded among World's Top 2% Scientist (Career-Long Achievement) Year 2022, World's Top 2% Scientist (Subject-Wise) Citation Impact during the Single Calendar Year 2019, 2020, 2021, and 2022 by Stanford University, US, PERINTIS Publication Award 2021 and 2022 by Persatuan Saintis Muslim Malaysia, Emerging Scholar Award by Automotive and Autonomous Systems 2021, Belgium, Young Scientists Network - Academy of Sciences Malaysia (YSN-ASM) 2021, UTM Young Research Award 2021, UTM Publication Award 2021, and UTM Highly Cited Researcher Award 2021. In 2021, he won Gold Award and Special Award (Kreso Glavac (The Republic of Croatia) at the Malaysia Technology Expo (MTE2022), Gold Award dan Special Award at International Borneo Innovation, Exhibition & Competition 2022 (IBIEC2022), and, a Gold Award at New Academia Learning Innovation (NALI2022). His main research interests are (1) Polymer Engineering (Biodegradable Polymers, Biopolymers, Polymer composites, Polymer-gels) and (2) Material Engineering (Natural fiber reinforced polymer composites, Biocomposites, Cellulose materials, Nano-composites). To date he has authored or co-authored more than 485 publications (published/accepted): 241 Journals Indexed in JCR/ Scopus, 3 non-index Journal, 18 books, 104 book chapters, 78 conference proceedings/seminars, 4 research bulletins, 10 conference papers (abstract published in the book of abstract), 17 Guest Editor of Journal special issues and 10 Editor/ Co-Editor of Conference/Seminar Proceedings on green materials related subjects.