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Editorial

Additive Manufacturing of Polymer–Fiber Composites

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Additive Manufacturing of Polymer–Fiber Composites is a newly open Special Issue of *Materials*, which aims to publish original and review papers on new scientific and applied research, and make great contributions to the finding and understanding of the fabrication of fiber-reinforced polymer composites using current advanced additive manufacturing techniques. This Special Issue also covers fundamentals, characterization, and applications of fiber-reinforced polymer composites.

The technology of the additive manufacturing (AM) process has significantly piqued the interest of researchers and industrial players from various areas [1–5]. Flexibility of this technology has increased the potential of research and exploration from the supply of materials until the end of life. Regarding the environmental aspect, the reduction in the need for raw materials in additive manufacturing will enhance the positive impact on the environment. Therefore, selection of the right eco-friendly sources of energy, recyclability and biodegradability, and maximizing the product's end-of-life value is important in AM [6–9]. Fiber-reinforced polymer composites have been employed in the early development of AM technology, and they have further potential application in various types of product design [10,11]. Moreover, the research and development of these materials are extensively progressing as the materials are varied and have unique characteristics.

Studies on fiber-reinforced polymer composites for the additive manufacturing process have been carried out by many researchers and become an interesting topic to be explored in the additive manufacturing industry. The aims of the inclusion of fiber in the polymer-based feed stock materials are to reduce the percentage of polymers and consequently reduce the harmful substances that may emit during the fabrication process in AM. Moreover, fiber-reinforced polymer composites could improve the properties of the dominant materials and exhibit good performance in the final products. Employment of the fibers in the AM process should consider the type of fiber, fiber treatment, fiber size, fiber loading, and fiber characteristics. It is important to understand the composition of fibers to ensure their

compatibility with the polymer, and how they could produce good resultant composites for AM.

The AM process starts from the preparation of the feed stock until the disposal of the fabricated parts [12]. The impact of this process towards the environment is a major concern of the industry since the AM process is known as an environmentally conscious manufacturing process, and consumption of the materials is optimum. However, due to the heating process of thermoplastic polymer that may cause adverse health effects towards humans, biopolymer and bio-composite materials are becoming alternative materials for the feedstock, and numerous studies had presented the advantages of these types of materials for AM. Process preparation of the biopolymers and bio-composites is less harmful and easy to dispose of at the end of its life. Hence, it is important to consider environmental elements during the AM process from the beginning until the end of life of the fabricated parts. Extensive studies should be conducted for various topic of additive manufacturing of fiber-reinforced polymer-based composites.

In this Special Issue, we aim to capture the cutting edge of the state-of-the-art research pertaining to advancing additive manufacturing of fiber-reinforced polymeric materials. The topic themes include advanced fiber-reinforced polymeric material development, processing parameter optimization, characterization techniques, structure–property relationships, process modelling, etc., specifically for AM.

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Short Biography of Authors

R. A. Ilyas is a senior lecturer at the School of Chemical and Energy Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), Malaysia. He received his Diploma in Forestry at Universiti Putra Malaysia, Bintulu Campus (UPMKB), Sarawak, Malaysia, from May 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 PhD degree in the field of Biocomposite Technology and Design at Institute of Tropical Forestry and Forest Products (INTROP) UPM. R.A. Ilyas was the recipient of MVP Doctor of Philosophy Gold Medal Award UPM 2019, for Best Ph.D. Thesis and Top Student Award, INTROP, UPM. He was awarded Outstanding Reviewer by Carbohydrate Polymers, Elsevier United Kingdom, Best Paper Award (11th AUN/SEED-Net Regional Conference on Energy Engineering), and National Book Award 2018, Best Paper Award (Seminar Enau Kebangsaan 2019, Persatuan Pembangunan dan Industri Enau Malaysia) and Top Cited Article 2020–2021 Journal Polymer Composite, Wiley, 2022. R.A. Ilyas also was listed and awarded among the world's top 2% scientists (Subject-Wise) citation impact during the single calendar year 2019 and 2020 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 2022, UTM Publication Award 2022, and UTM Highly Cited Researcher Award 2022. 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 404 publications (published/accepted): 164 Journals Indexed in JCR/Scopus, 2 non-index Journal, 15 books, 104 book chapters, 78 conference proceedings/seminars, 4 research bulletins, 10 conference papers (abstract published in book of abstract), 17 Guest Editor of Journal Special Issues and 10 Editor/Co-Editor of Conference/Seminar Proceedings on green materials related subjects.

A. S. El-Shafay obtained his PhD in Mechanical Engineering from Mansoura University, Egypt in 2021. Currently, he is a lecturer at the Department of Mechanical Engineering at Prince Sattam Bin Abdulaziz University, Saudi Arabia. Prior to joining Prince Sattam Bin Abdulaziz University, he was a lecturer and senior researcher at Department of Mechanical Power Engineering, Faculty of Engineering, Mansoura University—Egypt, between 2011 and 2021. His research interests include: wastewater treatment, renewable energies, energy conversion, biofuels, solar energy, gasification, hydrogen production, simulation and mathematical modeling, fluidized bed, internal combustion engines. Dr. El-Shafay has a strong track record in attracting funded research projects as well as scientific publications. He has authored >50 publications in peer-reviewed journals in the field of his research and interdisciplinary research areas. His research has been recognized through various national and international awards.

M. T. Mastura started her tertiary educational journey at the Language Institute of Seoul National University, Seoul, South Korea from 2003 to 2004 where she studied the Korean language (Level 1 until Level 6). She graduated with a Diploma in System Design from Dongyang Mirae University, Seoul, South Korea, or formerly known as Dongyang Technical College in 2007, and afterward in 2009, she graduated with a Bachelor of Science in Engineering from Korea University, Seoul, South Korea. In 2011, she completed her Master of Engineering in the field of Mechanics at Universiti Kebangsaan Malaysia, Selangor, Malaysia. In 2017, she graduated with her Ph.D. degree in the field of Mechanical Engineering at the Faculty of Engineering, Universiti Putra Malaysia, Malaysia. She started her work as an academician in 2009 and was appointed as senior lecturer in 2018. As an academician in an engineering school, she was awarded the Most Cited Article Award in the International Journal of

Precision Engineering and Manufacturing-Green Technology (IJPEM-GT), Springer, in 2020. She also was a recipient of the Best Manuscript Award in the 5th Postgraduate Seminar on Natural Fiber-Reinforced Polymer Composites, 2016. Her main research interests are: (1) Concurrent Engineering, (2) Natural Fiber Composites and Design and (3) Fused Deposition Modeling. To date, she has authored or co-authored more than 40 research articles including journal papers, chapters in the book, edited book, proceeding, etc., with 480 citations. She has been involved in research and education for more than 10 years and has been awarded more than RM 150,000 research grants in total.

Shahir Mohd Yusuf received his MEng Mechanical Engineering (with sustainable energy systems) from the University of Southampton, United Kingdom, in 2016. Subsequently, he was awarded a PhD from the same university in 2020 with a thesis titled 'Microstructures and Properties of Additively Manufactured Alloys Processed by Severe Plastic Deformation'. He is currently a senior lecturer at the Mechanical Precision Engineering (MPE) Department, MJIIT, Universiti Teknologi Malaysia (UTM) Kuala Lumpur, Malaysia. His research interests are in manufacturing and materials, particularly additive manufacturing (AM), also known as 3D printing, severe plastic deformation (SPD), hybrid manufacturing processes, advanced AM processes, and process-microstructure-property relationships. At present, he is working on affordable 3D printing of metallic materials using desktop fused filament fabrication (FFF) process, focusing on both machinery and materials development. In addition, he also researches 4D printing, a branch of 3D printing mainly dedicated to fabricating smart materials.

Emin Bayraktar (Prof. Emeritus, Habil., Dr (Ph.D.), DSc—Doctor of Science) is an academic and research staff member in Mechanical and Manufacturing engineering at SUPMECA/Paris, France. His research areas include manufacturing techniques of new materials (basic composites—hybrid), metal Forming of thin sheets (Design + test + FEM), static and dynamic behavior and optimization of materials (experimental and FEM—utilization and design of composite-based metallic and non-metallic, powder metallurgy, and energetic material aeronautical applications), metallic-based and non-metallic materials, powder metallurgy and metallurgy of steels, welding, and heat treatment, as well as the processing of new composites, sintering techniques, sinter–forging, thixoforming, etc. He has authored more than 200 publications in the International Journals and International Conference Proceedings, and has also authored more than 90 research reports (European = Steel Committee projects, Test + Simulation). He already advised 32 Ph.D. and 120 MSc theses, and is currently advising 7. He is a Fellow of WAMME (World Academy of Science in Materials and Manufacturing Engineering), Editorial Board—Member of JAMME (*International Journal of Achievement in Materials and Manufacturing Engineering*), Advisory board member of AMPT—2009 (*Advanced Materials Processing technologies*), APCMP—2008 and APCMP—2010. He was Visiting Professor at Nanyang Technology University, Singapore in 2012, Xi'an Northwestern Technical University, Aeronautical Engineering, in 2016, University of Campinas, UNICAMP-Brazil in 2013 until 2023. He is a recipient of the Silesian University Prix pour "FREDERIK STAUB Golden Medal-2009" by the Academy of WAMME, "World Academy of Science"—Poland, materials science section, and a recipient of the William Johnson International Gold Medal—2014, AMPT academic association.

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