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Editorial corner – a personal view

Moving towards biofiber-based composites: Knowledge gaps and insights

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Researchers, professionals, engineers, and scientists have recently been prompted to focus on using biofiber as a reinforcement in polymer matrices due to the environmental impact of synthetic fibers (https://doi.org/10.1016/j.carbpol.2018.11.083).

Most importantly, biofibers are a cheap, easily renewable, and even biodegradable material that is widely available in all countries. Another notable feature is that biofiber reinforced composites are relatively strong, lightweight, and biodegradable, allowing them to be employed in a variety of applications (https://doi.org/10.1002/pc.26110). In addition, the usage of bio-based composites in industries has gradually expanded, helping biofiber production and the global economy, implying that it will assist farmers indirectly (https://doi.org/10.3144/expresspolymlett.2020.27). Also, these bio-based materials are quite capable of serving as a cost-effective, technologically viable, and attractive substitute to conventional synthetic fiber composites for industrial usage (https://doi.org/10.1007/978-3-030-40301-0).

We found several knowledge gaps in this field (https://doi.org/10.1002/pc.26413). The majority of the researchers prepared composites through hand lay-up and compression molding. As a result, future researchers will be able to investigate the effects of various manufacturing processes. The impact of stacking sequence and hybridization of two or more biofibers in a single composite has received less attention. In addition, the most prevalent kind of biofiber explored in prior studies is unidirectional long fibers or randomly oriented short fiber shapes. When a biofiber composite is hybridized with another biofiber, the mechanical qualities are not superior to when the composite is hybridized with synthetic fiber. The optimal option with a good balance of attributes and cost is a hybrid laminate with two extreme synthetic plies on either side. The ability to create good interfacial bonding between biofibers and polymers is one of the most difficulties facing researchers today (https://doi.org/10.1016/j.jclepro.2020.120978). Due to the hydrophilicity of the biofibers and the hydrophobicity of the polymers, this is a challenging task. Chemical and surface treatments, on the other hand, are a superior way to solve this problem (https://doi.org/10.1002/pc.26312). Special treatments in biofibers, according to some authors, could lead to the fabrication of high-quality composites with superior properties. Materials made from renewable resources, such as biofibers embedded in a matrix of polymers termed biopolymers, have been proven to be good alternatives to synthetic fiber composites, according to some recent studies (https://doi.org/10.1016/j.ijbiomac.2020.03.120).

The life-cycle considerations have become important in the development of a product from bio-fiber composites due to recycling and durability analysis. These life-cycle considerations are helpful to develop biofibers into useful products by addressing the issues related to drawbacks for industrial applications (https://doi.org/10.1177/1528083720924730).

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This editorial corner will give many new insights for future researchers to explore other aspects of biofiber-based composites. The hybridization effect on the composite's characteristics can be determined using the different layering sequences of the hybrid composite. Extensive experimentation can be used to determine the dynamic mechanical and tribological properties for suitable usage of biofiber-based composites in various engineering applications. Experiments can be expanded by including potential new biofibers, adjusting fiber orientation and fiber content, and analyzing their attributes. It is possible to study the appropriateness of biofillers and biopolymers in biofiber composites. Furthermore, study into supply chain management, life-cycle assessment, and machine learning may be appealing and necessary in this subject in order to use these materials as a potential alternative for synthetic or traditional materials and to give a better market.

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