Effect of NaOH Concentration on 3D Printed Bagasse Reinforced Composite Material

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Abstract

Sugarcane bagasse is the byproduct of the sugarcane industry as well as the sugarcane juice producing vendors. Although the bagasse fiber has several applications still there is an excess of the fiber which is considered to be a waste. So the main objective of this study is to utilize the excess by product and to reduce environment pollution by converting them into functional and useful reinforced composite materials by using 3D printing method and analysis the effect of NaOH concentration on the reinforced composite material. Three different chemical process are done to extract very thin bagasse fiber. Among the three process two process are quite similar because in both process the bagasse fibers are immerged in 1% NAOH solution but the required immersion times are varied, being 25 hours and 24 hours, respectively. In another process the fiber are immerged in 5% NAOH solution for 15 hours and then the thin fibers are extracted. After extracting the fibers several composite samples of these treated bagasse fibers are reinforced using UV sensitive resin by applying the additive manufacturing technique also known as the 3D printing technique and these composite samples are prepared following the ASTM standards (ASTM d638, type-4).To analysis the effect of NaOH concentration on these composite the mechanical test like tensile test is conducted to evaluate the tensile property of these composite. The composite samples are fabricated using the extracting bagasse fibers which are immersed in 5% NaOH solution for 15 hours shows better tensile property among the three process.

Key Words
Composite, 3D printing, tensile test

Biographies

Rakibul Hasan Raihan is an undergraduate student of Ahsanullah University of Science & Technology from the Mechanical Engineering (ME Program) of the Mechanical & Production Engineering Department. His research interests include the area of Computational fluid dynamics, Energy science, Machine design, Artificial intelligence and robotics, Material science, Engineering mechanics, Fracture of composite materials, Additive manufacturing (3D printing), Renewable energy, Power plant technology etc. He has experience short time industrial exposure training at Ghorashal Power Station (GPS).

Nabil Chowdhury is an undergraduate student of Mechanical Engineering (ME) under the Department of Mechanical and Production Engineering (MPE) at the Ahsanullah University of Science and Technology (AUST). His research interest includes the area of Renewable Energy System, Composite materials, Computational Aerodynamics, Advance manufacturing, Thermo-Fluids. He is a member of IMechE (UK). He has participated along with his team (Team Primus) for the very first time from Bangladesh in “Formula Student UK 2019” (FSUK 2019) and achieved two awards- Allan Stainforth Award for Best Newcomer 2019 and RACE TECH Spirit of Formula Student 2019. He served as the executive for the tech festival "MINDSPARK 2019" which was international collaboration between AUST IDC and COGNIZANCE, IIT ROORKEE. He has taken part in different tech-based competitions and achieved prizes in Bangladesh like Macceleration'18, Mindsparks'19 etc. He is also a member of EMK Center. He is quite competent in Solidworks, Matlab, Fusion 360, and Microsoft office, Autocad, XFLR5.He aspires to conduct in-depth research in his field of interest.

Kazi Ahasan Ekram is an undergraduate student of Ahsanullah University of Science & Technology from Mechanical Engineering program under the department of Mechanical & Production Engineering. His research interests include the area of natural fiber reinforced composites, material property analysis, mechanical behavior of materials, mechanical properties, aerodynamics, modeling and simulation. He experienced a short time industrial attachment at Bangladesh Industrial Technical Assistance Center (BITAC).

Md. Ershad Khan is an Associate Professor in Textile Engineering under the department of Textile Engineering (TE) at Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh. He has 16 years of professional experience in several industries as well as academia. He has competed his B.Sc. in Textile Technology and M.Sc. in Textile Engineering degree from Bangladesh University of Textiles (BUTEX). He is currently pursuing his PhD in Chemistry from Bangladesh University of Engineering and Technology (BUET). He was former member of Society of Dyers and Colourists (SDC, UK) and American Association of Textile Chemists and Colorists (AATCC). He is an active member of the Institution of Engineers, Bangladesh (IEB). He has authored a book titled ‘Technology of Denim Manufacturing’. Moreover, He has a good number of research articles published in various Journals and conference proceedings. His research interests include sustainable textile processing, smart textile materials, antimicrobial textiles, and composite materials.

Dr. M. Azizur Rahman is an Assistant Professor in Industrial and Production Engineering (IPE) under the department of Mechanical and Production Engineering (MPE) at Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh. He is a member of IEB (Bangladesh), OCIEBS (Singapore) and IMechE (UK). Dr. Azizur is a registered Chartered Engineer (CEng, UK). He earned B.Sc. in Mechanical Engineering from Bangladesh University of Engineering and Technology (BUET), Masters in Mechanical Engineering from National University of Singapore (NUS), Master of Science (Logistics) from Nanyang Technological University (NTU), Singapore and Ph.D. in Mechanical Engineering from National University of Singapore (NUS), Singapore. Dr. Azizur is currently serving as a Guest Editor for Special Issue "Intelligent Additive/Subtractive Manufacturing" in Journal Micromachines. He also serves in Editorial, Advisory, and Review Board of IJAMP (International Journal of Advanced Manufacturing Processes), JPSME (Journal of Production System and Manufacturing engineering), AOE (Annals of Engineering). Dr. Azizur has extensive working experience in various manufacturing industries in Singapore. His research interests include Additive manufacturing (3D printing), Metal cutting and Ultra-precision machining, Electrical discharge and

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