The Influence of Weight Fraction on Tensile Strength of Three-Dimensional Printed Jute Fiber Reinforced Composite

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Abstract

Three-dimensional (3D) printing is an additive process that involves building up layers of material to create a 3D part. This is the inverse of subtractive manufacturing processes, which involve cutting a final design from a larger block of material. Jute fibers due to their availability and increasing demand for environmentally friendly materials marked their importance in composite engineering. Composites are new materials made up of two or more different materials with the goal of producing a new material with better properties than the constituent materials. Natural fibers had many advantages over synthetic fibers, which would include low cost, low density, renewable, and bio - compatibility. This experimental work aims to study the effect of weight fraction on the tensile strength of 1% alkaline (NaOH) solution-treated jute fiber with 405nm Ultraviolet (UV) thermoset liquid to make the reinforced composite with the help of digital light processing stereolithography process. Digital light processing stereolithography (DLP SLA) 3D printers accept STL files or CAD files that can be cut into layers before printing using slicing software.The build platform of the printer is submerged in a vat of liquid resin, and each layer is projected onto it by a digital light source.The light causes the resin on the platform to cure, resulting in a solid sliver of the part. Layers are built on top of one another until each layer is finished, at which point the part is removed from the build platform for post-processing.Alkaline treatments remove a certain amount of lignin, wax, and oils from the fiber cell wall's external surface, depolymerize cellulose, and expose short-length crystallites. In our experiment we manufacture jute fiber reinforced composite with the help of digital light processing stereolithography Process. Digital light processing (DLP) stereolithography (SLA) 3D printers are popular for producing high-accuracy, isotropic, and watertight

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prototypes and parts in a variety of advanced materials with fine features and smooth surface finish. In our experiment we show the how the weight fraction influence the tensile strength and other properties.

Keywords
Polymer Composites, Vat Polymerization, 3d Printing, Natural Fibers and Weight Fraction.

Acknowledgements
For the fabrication work, 3D Printing Hub will help to provide technical assistance.

Biographies
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Jonaed Hossain is an undergraduate student of Mechanical Engineering (ME) under the department of Mechanical and Production Engineering (MPE) at Ahsanullah University of Science and Technology. He has great interest in 3D printing, composite material and industry 4.0. He has good experience in product design and development. He has short time industrial training at Bangladesh Industrial Technical Assistance Center (BITAC) and also taken part different kinds of tech based competition throughout his educational career.

Arafath Mohiv is an undergraduate Mechanical Engineering (ME) student at Ahsanullah University of Science and Technology's Department of Mechanical and Production Engineering (MPE) (AUST).His research interests include Additive Manufacturing, Industry 4.0, Product Design & Development, Generative Design, and the Reverse Engineering Process.He is proficient in Soildworks,Matsercam,catia,Ansys,Autocad,Fusion360,Simplify3D,Pursa Slicer, Photon Workshop,Cura,Keyshot and the C and Python programming languages.He aspires to conduct extensive research in Additive Manufacturing, Industry 4.0, non-traditional manufacturing processes and so on.

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