Effect of alkaline treatment on mechanical properties of palmyra and S-glass fiber reinforced epoxy nanocomposites

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Although epoxy resins have many advantages, their use needs to be expanded by improving their mechanical properties, including a wide variety of material quality, easy processing, negligible shrinkage due to curing, and good adhesiveness to many forms of fiber materials. The research focuses cost-effective utilization of palmyra fiber treated with 5% alkali solution and different volume percentages of S-glass fiberglass incorporated by epoxy resin developed by hand layup technique. The final epoxy hybrid composite consists of different weight ratios of palmyra/S-glass fiberglass as 25:75, 50:50, and 75:25. Influences of palmyra (treated) fiber dispersion quality on density, voids, mechanical and moisture absorption performance of the epoxy hybrid composite is studied by ASTM rule. The elevated output characteristics performance is compared with untreated fiber composite. Based on the rule of mixture, composite density is varied and Archimedes' principle measures voids. The alkali treated composite samples showed good tensile stress, flexural and impact strength. While compared to untreated fiber composite, the tensile, flexural, and compressive strength of TPF/GF(25:75) composite was improved by 19.58%, 29%, and 14.3%, respectively. The reduced water absorption behaviour was observed on the treated composites. The effect of fiber dispersion on the mechanical failure of hybrid composite is studied by SEM analysis.

Publication:	Archives of Civil and Mechanical Engineering, Volume 23, Issue 2, article id.116
Pub Date:	May 2023
DOI:	10.1007/s43452-023-00662-2
Bibcode:	2023ACME...23..116S
Keywords:	Alkaline treatment; Palmyra fiber and glass fiber; Hybrid nanomaterial; SEM; Water adsorption studies