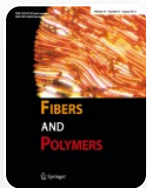


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Investigation of Quartz–Rich Granite Dust Particle–Reinforced Aluminized Glass–Kenaf Fiber–Reinforced Polyester Composite: Load Bearing, Water absorption and Flame Properties

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Abstract

The study aims to analyze the mechanical, thermal, fatigue, water absorption, flammability and creep properties of aluminized glass, kenaf fiber, and silane-treated granite dust particle reinforced polyester composites. Silane treatment was conducted to enhance interfacial bonding and dispersion of granite dust particles. Composites were fabricated using anhydride polyester resin, curing agents, and reinforcements. Laminates were prepared via sandwich construction with alternating layers of fibers. Results revealed that the specimen G2, containing optimized filler content, demonstrated superior mechanical properties compared to G0 and G1. Specifically, G2 showed a tensile strength of 147 MPa, flexural strength of 201 MPa, ILSS of 30 MPa, compression strength

of 161 MPa, Izod impact of 7.1 J, specific wear rate of 0.11 mm³/Nm, thermal conductivity of 0.19 W/mK, and flammability (propagation speed) of 7.32 mm/min. It also exhibited minimal water absorption of 0.011%, fatigue strengths ranging from 33,251 to 27,411 at different percentages of UTS, and creep values ranging from 0.0028 to 0.0018 at 5000 s to 15000 s. These results highlight G2's enhanced load-bearing capacity, impact resistance, wear resistance, and thermal insulation. Although G3 displayed better values for wear resistance, flammability, water absorption, thermal conductivity, and creep, the excessive filler content did not improve mechanical properties. SEM analysis was conducted for investigating the microstructural changes in the specimens. G2's optimized balance between filler content and mechanical performance suggests its potential for various engineering applications, offering improved strength, durability, and thermal stability. This makes the composite material to be tougher enough and could replace existing metallic materials in aerospace, automobile, space science, defence weapon manufacturing, household domestic appliances, and various biomedical applications, etc.

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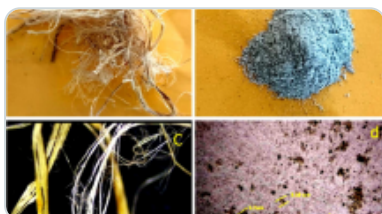
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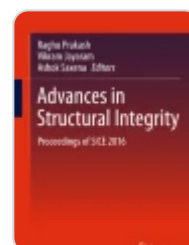
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Contributions

N. Ram Prakash—research, writing and testing; C. Gnanavel—material arrangement and writing.

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Conflict of Interest

The authors have no conflicts to disclose.

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Consent to Participate

Not applicable.

Consent for Publication

Yes.

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