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(57) Abstract :
The present invention focuses on the development of a hybrid composite material reinforced with Grewia Optiva fiber and marble dust, using epoxy resin as the polymer matrix. The fabrication process involves NaOH treatment of natural fibers to enhance fiber-matrix bonding, followed by a hand lay-up technique for composite formation. The hybridization of Grewia Optiva fiber with marble dust aims to improve mechanical strength, hardness, and wear resistance while maintaining a lightweight structure. The composite is subjected to physical, mechanical, and thermal characterizations, including tensile, flexural, impact, ILSS, hardness, DMA, and wear tests. Taguchi optimization is employed to identify the ideal composition for minimal wear rate. This novel composite offers a cost-effective, eco-friendly, and high-performance alternative for various applications in automotive, aerospace, and structural industries. The incorporation of marble dust also promotes sustainable material utilization by repurposing industrial waste.

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