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Manufacturing of novel cork-STF composites designed for impact energy absorption

Advances and innovations in manufacturing processes / Trends in manufacturing systems and automation

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Abstract Text

Shear thickening fluids (STF) viscosity significantly increases when subjected to an external dynamic load. Recent advances show their potential for engineering applications, such as developing shock absorbers and impact energy-absorbing structures. There is a search for sustainable materials for several applications due to the critical need to replace nonrenewable raw materials. Cork is a sustainable material reported to be an excellent alternative to synthetic energy absorbers thanks to its cellular microstructure and cell wall composition. This work explores the development of cork-STF composites designed for impact energy mitigation. The cork-STF composites were manufactured by compression moulding, exploring different compositions of both materials. Additionally, the manufactured compounds were characterized by submitting samples to impacts. The results made it possible to conclude that deagglomeration occurs for STF concentrations higher than 20%. On the other hand, good results were achieved with compounds that have less than 20% of STF in their composition and can withstand impact loading. Therefore, the energy absorption of white cork agglomerates decreases with STF. Nevertheless, the agglomeration was successful, and this design can be adapted for other specific purposes, applications, or even strain rates than the ones explored in this work.

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