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Investigation of biomass derived materials effect on mechanical properties in the inner shelf vehicle part

Abstract:

The automotive industry, which has been directly affected by concerns about lightweight and CO₂ emission reduction, has led many scientific studies about sustainability topics in recent years. The development of bio-based parts in the automotive industry with a focus on sustainability is increasing as a result of the advantages they offer. The motivation of this article is to examine the mechanical strength alteration of polypropylene materials with diverse talc and jute fiber ratios in the interior inner shelf part compared to the existing 20% talc polypropylene. Based on this, jute fiber was compounded with engineering plastics in order to form a biomass-derived material. Appropriate mechanical and aesthetic features were targeted by developing two distinct bio-based polymers with talc-free jute fiber compound and talc-added jute fiber compound for the inner shelf interior target part that occurs in light commercial vehicles. Tensile tests were performed on the existing material and bio-based materials following compounding. Regarding the finite element analysis (FEA); modal analysis, local deflection and thermal analysis were conducted considering the stress and displacement distributions and natural frequency. In line with the analyses, the existing material and the developed materials were compared. Besides; hardness, odor, and scratch test were performed in order to investigate the talc and biomass effect on curtain holder products. In addition to this, prototype production was carried out and the surface quality was investigated. Considering the FEA and product tests it was determined that talc added jute fiber compound exhibited appropriate mechanical features and encountered boundary conditions.

Biography

Ali Ulaş Malcioglu has a passion for materials science and has expertise in this field. Mr. Malcioglu, who is Ph.D. materials engineer, works at Assan Hanil Automotive as Advanced Research Manager for 4 years. Associated with his 8 years of experience in R&D, he gained competence in the fields of, material characterization, aluminum alloys, polymer materials, composite materials, and defect analysis and also maintained his studies in this direction. In addition, he took part in many projects based on weight reduction, composite materials and material characterization and successfully completed the projects from an academic and technical point of view.