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Thermal characterization of vegetable tannin reinforced TPU-based bio-composites

Fatma Erdogan, Arife Candaş Adiguzel Zengin, Onur Yilmaz, Hüseyin Ata Karavana and Fatma Akpolat
Ege University, Turkey

The aim of this study was to investigate the use of vegetable tannin as a potential reinforcement material in polymer composites for the production of footwear sole material. For this purpose, the acorn cups and the waste of acorn obtained after the tannin extraction was used as the reinforcement materials for thermoplastic polyurethane (TPU) based composites. Alkali treatments were applied for modifying the surface of acorn cups and pulps to increase the compatibility between the filler and polymer matrix. The preparation of the composites with different filler loadings (10, 20 and 30 wt%) was performed via hot melt extrusion. The effect of surface modification on the thermal and morphological characteristics of the bio-composites was investigated in terms of Fourier transform infrared (FT-IR) spectroscopy, differential scanning calorimeter (DSC), thermogravimetric analysis (TGA) and scanning electron microscopy (SEM) analyses. The FT-IR results showed that the vegetable fillers were incorporated into the polyurethane matrix successfully and partial structural modifications were occurred as a result of the alkali treatments. Although the thermal resistance of composite materials at low temperatures was found slightly lower than the TPU, higher thermal resistance values were obtained at higher temperatures. Overall results showed that the homogenous dispersion of vegetable fillers within the polymer matrix was achieved successfully and the obtained bio-composite materials were found to be a good candidate to use as bio based footwear sole material.

Biography

Fatma Erdogan has graduated in Mechanical Engineering in 2014 and is pursuing her Master's from Ege University in Material Science and Engineering. Her areas of interests are Polymeric Composites, Biocomposites and Polymer Materials. She is also interested in biomedical materials, biomedical structures and their finite element analysis.

fatmaerdogann89@gmail.com

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