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Highly efficient and versatile photoinduced thiol-ene crosslinking to prepare antibacterial and antioxidant materials derived terpenes

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Bio-based networks derived from eugenol were prepared with an eco-friendly process by photoactivated thiol-ene reactions. Allyl derivative eugenol, prepared by a nucleophilic substitution was combined with linalool, a monoterpene present in the lavender essential oil, well known for its antibacterial activity, with eugenol, or carvacrol, sustainable antioxidant molecule components of the essential oil of clove and oil of thyme, respectively. The photoactivated thiol-ene reaction is a quick room temperature straightforward way to obtain renewable cross-linked networks. Several systems have been developed including, covalent grafting of linalool, eugenol, or inclusion of carvacrol moieties to obtain functional materials. Two bacteria strains were used *in vitro* to evaluate the resistance to bacterial adhesion and the DPPH method was used to determine the antioxidant properties of the networks. As expected, the results showed a strong anti-adhesion activity against *S. aureus* and *E. coli* due to the presence of eugenol moieties and carvacrol release. Moreover, the phenol groups of grafted eugenol or free carvacrol provide an antioxidant activity characterized by a radical scavenging activity higher than 90%.

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

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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 material 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.

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