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Improving cork polymer composites for the automotive industry

The pressure imposed by legislations and treaties to adopt more sustainable and eco-friendly alternative materials is rising. Therefore, the use of cork-polymer composites (CPC) in the automotive industry could bridge the difficulties they have complying with the environmental laws and the need of giving a second life to the cork industrial wastes. From the cork processing, residues are generated, also called cork subproducts, with granulometries that wouldn't be possible to use in other cork typical applications. With the purpose of implementing a circular economy model and reduce the waste that would be generated in normal conditions by burning or by throwing the cork residues in a landfield, the investigation and the development of new products involving these residues are taking place.

This work aims to develop and characterize cork polymer composites with properties suitable for the automotive industry. Polypropylene was selected due to its very good characteristics in terms of cost, ease to process and chemical resistance combined with the fact that polypropylene is one of the four main polymers used in the industry. To improve the processing and characteristics of PP/cork composites different additives were studied, namely maleic anhydride as a bonding agent; lignin stabilizer and UV additives (UVA and HALS), to coat the cork and reduce its color loss; an odor absorber in order to reduce the volatile gases freed by the composites; and anti-block and slip agents to facilitate the processing of the composites. In this work, cork particles were compounded with polypropylene by twin-screw co-rotating extrusion and further processed by injection or compression molding. The PP/cork injection molded parts were used to investigate the tensile, impact, odor, and water absorption properties. The incorporation of the different additives was studied and evaluated. The addition of polypropylene-graft-maleic anhydride up to 4wt.% improved the tensile and the impact properties of the composite. By adding an odor absorber, it was possible to conclude that the intensity of the smell was reduced, despite using an empirical method to access it. The thermos-physical properties were investigated and the composites present low water absorption. The compression molded specimens were used in the UV chamber exposure to access the color loss of the composites. The addition of lignin stabilizer and UV additives revealed great results. In conclusion, the additives used to improve the cork-polymer composites were useful to provide better overall properties to the composite and to potentiate a new material to the automotive industry.

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