

Valorization of Plastic and Cork Wastes in the Production of New Composite Materials

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Extended Abstract

Plastics is a revolutionary material widespread in everyday life [1]. However, it is important to find the new way to recycle and reuse this plastic because there are about 5-13 million tons of plastic end up in the ocean. Pollution caused by plastics damages of the environment, human health and economy of different countries. The plastic waste management is the global problem. The large volume plastics requires strategies to improve the valorization of the waste generated after consumption in order to minimize impacts [2]. The several works have been shown that the use of recycled polymer for composites production can be a feasible alternative from an economical and environmental point of view [2-4]. The use of the waste materials as filler and as a matrix for the composite materials is receiving increasing attention as an approach to increasing the economic value of streams.

In this study, a new composite material based on polymer waste (PP and HDPE caps) and cork powder from unused cork (virgin cork) was developed. The interest the use of cork is a high capacity for thermal insulation.

The composite materials were obtained by twin-screw extrusion and by injection moulding. The composites were produced with proportions of 0 %, 5 %, 10 %, 15 %, 20 % of cork powder in a polymer matrix. These composites were investigated in term of mechanical, structural and thermal properties.

The results show that the addition of cork powder in the polymer matrix reduced the density of the composites. However, the incorporation of natural additive doesn't have a significant effect on the water adsorption. Regarding the mechanical properties, the value of tensile strength decreases with the addition of cork powder ranging from 30 MPa to 19 MPa for PP composites and from 19 MPa to 17 MPa for HDPE composites.

Evaluation of the flammability of the composites was performed using the cone calorimeter. Results show, for example, that the peak HRR value for composites based on PP and HDPE with 10 % of cork is 534 kW/m² and 686 kW/m² respectively. The value of thermal conductivity of composites PP/cork and HDPE/cork is about 0.170 W/mK and 0.230 W/mK respectively.

The feasibility of the composites based on cork and PP and HDPE wastes opens new ways of valorization of plastic wastes and virgin cork. The thermal insulation and fire resistant properties will be optimized.

References

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