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Magnetic cork particles as reinforcement in an epoxy resin: effect of size and amount on thermal properties

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Abstract-

Natural brightness of epoxy adhesives can be reduced by adding cork. Besides, when cork was magnetized, it was possible to move them depending on the properties required in each section of the adhesive bond (PAT354/2019). The main objective of this work was to study possible changes in the thermal properties of the adhesive due to the addition of magnetic cork particles. If changes were significant, the use of magnetic cork particles would be compromised. To this end, natural cork particles and magnetic cork particles, with two different particle size (53–38 and 250–125 μm) and percentage (1 and 5 v/v%), were compared as reinforcement material. Magnetic cork was obtained by co-precipitated coating, according to patent number WO2019025651. The thermal properties studied by Differential Scanning Calorimetry were activation energy of curing reaction, glass transition temperature (Tg) and thermal conductivity. Two different hardeners were studied and a factorial design (2k with k = 4) was carried out. It allowed to determine which variable or combination of variables had most impact on thermal properties. Results showed that the main parameter affecting thermal properties was the hardener, regardless of the kind of particle used. However, the presence of magnetic cork highlights further the differences found between hardeners. The conclusion of this study was that magnetic cork particles can be used as fillers in epoxy resin to make graded joints, since they do not affect the thermal properties of the resin.

Index Terms- Polymer composite; Thermal properties; Adhesive; Cork; Magnetic cork

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