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Abstract

Effect of Reprocessed PPS on the Mechanical Performance of Injection Molded Parts †

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In the automotive industry, there is an increasing demand for the recyclability of the materials that are used in the parts. This demand has a special focus in the composite materials currently being used, such as those based on thermoplastic polymers, given their recycling capability. One of the thermoplastic polymers used for automotive applications is the Polyphenylene Sulfide (PPS) mainly because of its great chemical resistance and high temperature resistance, but also due to its low viscosity, which permits PPS to be molded with high loads of fillers, such as glass fibers and minerals.

The main purpose of this research is to study the effect of reprocessed PPS on the performance of the parts produced by injection molding. The black-colored compound of polyphenylene sulfide with 65% of glass fibers and minerals were once processed by injection molding and transformed back into the form of pellets by a granulation process. This material was then mixed with the same grade of virgin material and reprocessed by injection molding in different percentages of reprocessed PPS (PPSr), namely 0, 20%, 40%, 60%, 80% and 100%. Tensile and impact injection molded specimens were produced to facilitate the evaluation of the mechanical properties. In addition, the characterization of the fiber length and the morphology of the part were accessed. The results are showing no great difference on the fiber length of the reprocessed material compared to virgin PPS. In up to 40% of the PPSr the impact properties are maintained; the average values between 22–23 kJ/m^2 were obtained from 0–40% of PPSr and reduced to 16 kJ/m^2 when 100% of the PPSr was used. Regarding the tensile behavior, PPS-GF65 has a fragile behavior, presenting in its datasheet a tensile strength of 155 MPa and an elongation of 1%. The results obtained for injection molded PPS parts reduced gradually from 145 MPa (PPS) to 120 MPa for 100% PPSr. The maximum decrease in tensile strength was in the order of 17%. The elongation at break reduced from 0,93 % (PPS) to 0.75% for 100% PPSr. The results are showing a loss on the mechanical performance not higher than 20% for the case of 100% PPSr, which indicates to be possible to consider the use of reprocessed PPS material for new plastic products.

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