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Effect of the processing conditions on the mechanical and electrical properties of extruded conductive PP tape and filament.

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Polypropylene (PP) shows a number of desirable properties that make it a versatile material among thermoplastic polymers. Due to its low cost and density, it is an excellent resin for conductive polymer composites (CPCs).[1] CPCs mainly consist on a polymer matrix with incorporated carbonaceous fillers. These multifunctional materials are routinely employed in various commercial applications due to their good electrical conductivity, corrosion resistance, light weight and enhanced mechanical properties. [2]

The filler content is the crucial aspect in conductive polymer composites fabrication: due to mechanical behaviour it must be as low as possible but enough to allow fulfilling the electrical requirements.[2]

In this work commercial conductive master batch PP was extruded in the form of tape and filament using different processing conditions, namely different draw ratios and temperatures. In order to tailor the mechanical performance of the material, different several amounts of PP homopolymer were added to the commercial conductive resin. The results show that the amount of homopolymer directly influences mechanical and electrical performance of the material. Increasing homopolymer content yields a more stretchable, and mechanically resistant, material but, on the other hand, reduces its electrical conductivity. This study focuses on the optimization of the processing conditions and composition in order to tailor the mechanical and electrical properties of the material for specific applications.

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Keywords: polymeric composite; polymer conductivity; mechanical proprieties

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