

Investigation of the Physical, Mechanical and Thermal Properties of Reprocessed Polypropylene Mixed with Talcum



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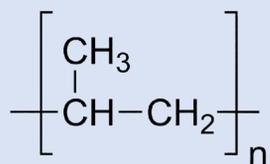
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ABSTRACT

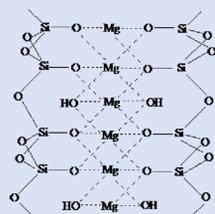
Environmental conservation is a crucial issue today, and recycling plastics without affecting their mechanical and thermal properties can help mitigate global warming. This study examines the reprocessing of PP-talc and its impact on mechanical properties through impact, tensile, and flexural tests, as well as melt flow rate analysis, thermal property evaluation, and chemical structure analysis. The results indicate that PP-talc reprocessed up to five cycles shows no significant changes in mechanical properties, suggesting that it can be reused up to five times without degradation.

INTRODUCTION

The automotive industry generates significant plastic waste during manufacturing. Recycling is a key solution to reduce and reuse plastic scraps. This study examines polypropylene mixed with talcum, a widely used polymer due to its ease of molding, strength, and resistance to heat and moisture. Talcum enhances these properties, making the material ideal for car bumpers.



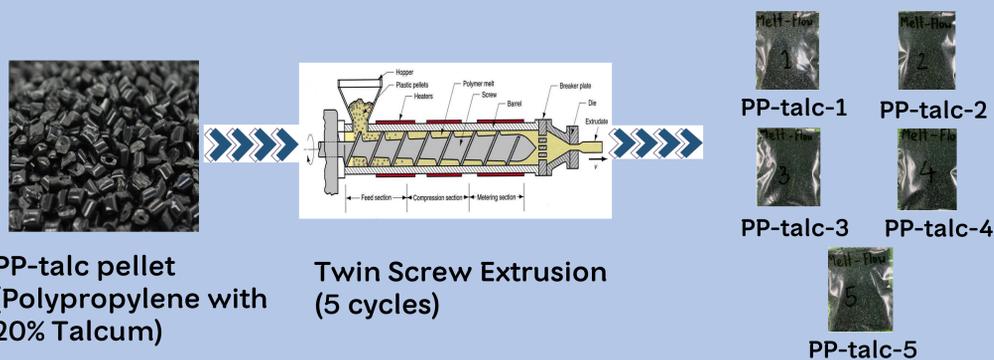
Structure of Polypropylene



Structure of Talcum

METHODOLOGY

Preparation of plastic pellet samples



Preparation of sheet specimens



RESULTS AND DISCUSSION

Mechanical properties

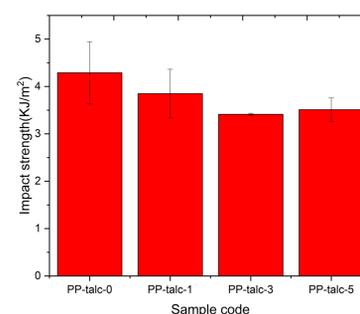


Fig.1 : Impact strength of polypropylene mixed with talcum after reprocessing 5 cycles

Physical properties

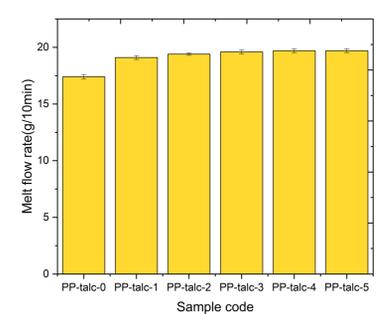


Fig.4 : Melt flow rate of polypropylene mixed with talcum after reprocessing 5 cycles

Thermal properties

Table 1 : Effect of reprocessing cycles on thermal properties (Melting temperature, T_m)

Reprocessing cycles of PP-talc	T_m (°C) of peak 1	T_m (°C) of peak 2
0	127.4	166.5
1	127.1	167.7
3	126.5	167.0
5	126.8	167.3

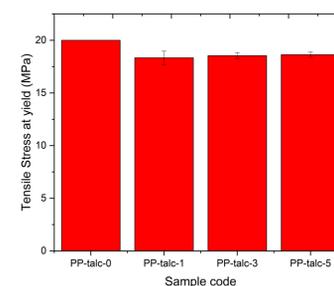


Fig.2 : Tensile stress at yield of polypropylene mixed with talcum after reprocessing 5 cycles

FT-IR Spectra

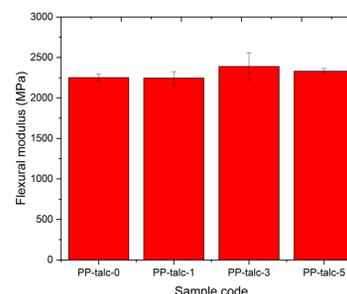


Fig.3 : Flexural modulus of polypropylene mixed with talcum after reprocessing 5 cycles

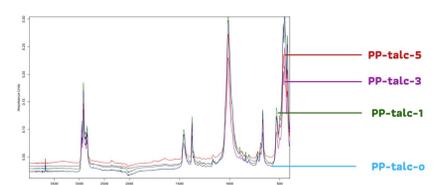


Fig.5 : FT-IR spectra of polypropylene mixed with talcum after reprocessing 5 cycles

The test results show that the values of physical, mechanical, and thermal properties did not decrease significantly. Additionally, the thermal property test revealed the appearance of another peak, which may correspond to the melting temperature of LLDPE.

FT-IR results, stacking the graphs shows that the peak positions of the substances remain unchanged, indicating that the structure of the substance has not changed.

CONCLUSION

In the study of the recycling cycles of polypropylene mixed with 20% talcum, the findings indicate that after five recycling cycles, the mechanical properties of the polypropylene mixed with 20% talcum remained unchanged. This additive (Talcum) may have contributed to maintaining the mechanical properties and preventing significant degradation. As a result, the polypropylene mixed with 20% talcum can be reprocessed up to 5 cycles with no property change.

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