COMPARISON OF COUPLING AGENTS EFFICIENCY IN GLASS FIBER REINFORCED POLYPROPYLENE

INTRODUCTION

By using coupling agent: PP, grafted with maleic anhydride, we can improve mechanical properties of composites with PP and short-chopped glass fibers.

PP interacts favorably with the polyolefin matrix, while grafted maleic anhydride offers compatibility with glass fibers.

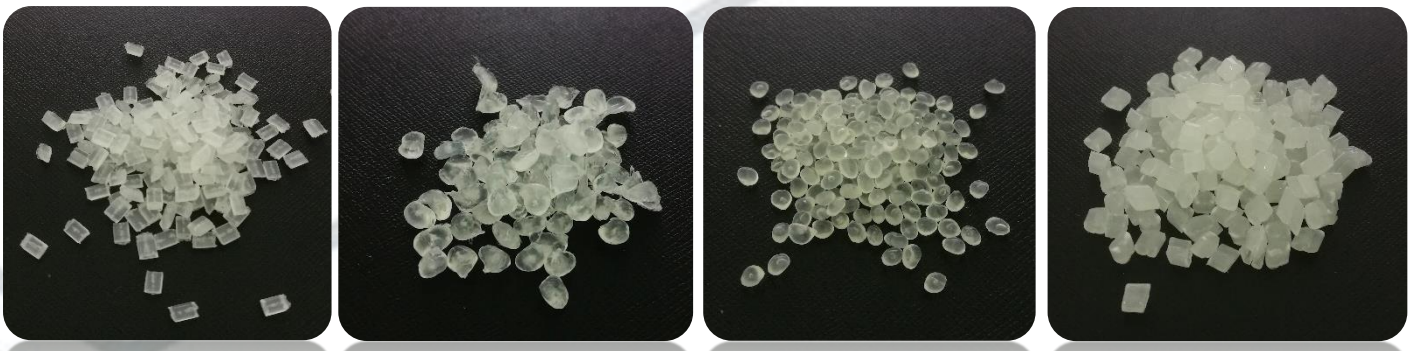
MATERIALS USED

PP matrix: Resinex 2004 RXP PP Homopolymer

Glass fibers: ThermoFlow 601

Coupling agents (from left to right):

- Bondyram 1001
- Exxelor 1020 PO
- Scona TSPP 10213 GB
- GRAFTABOND PPH-MAH 70025 CA



Prepared Mixtures were all with:

20% Glass Fibers

1% coupling agent

Material Report

SAMPLE TESTING AND PREPARATION

Samples were prepared and tested (Pictures from left to right):

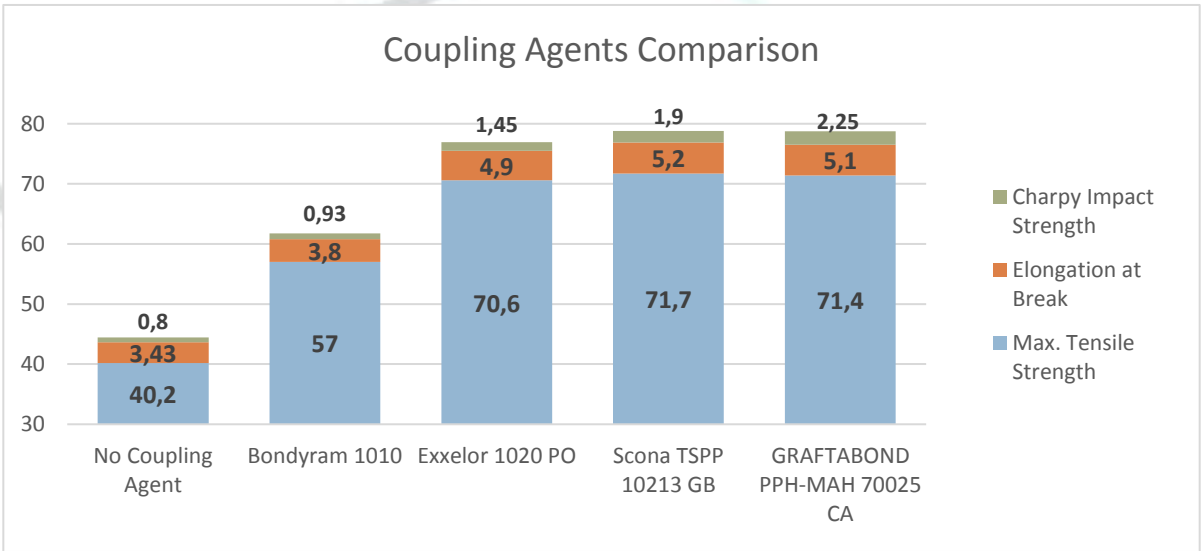
- Twin screw extrusion of PP with GF
- Injection molding of specimen for mechanical tests
- Tensile test
- Charpy Impact Test




RESULTS

Tensile tests were done in A1 specimen, in accordance with ISO 527-2.
Charpy Impact Strength was done on 1eA specimen (Notch type A), in accordance with ISO 179.

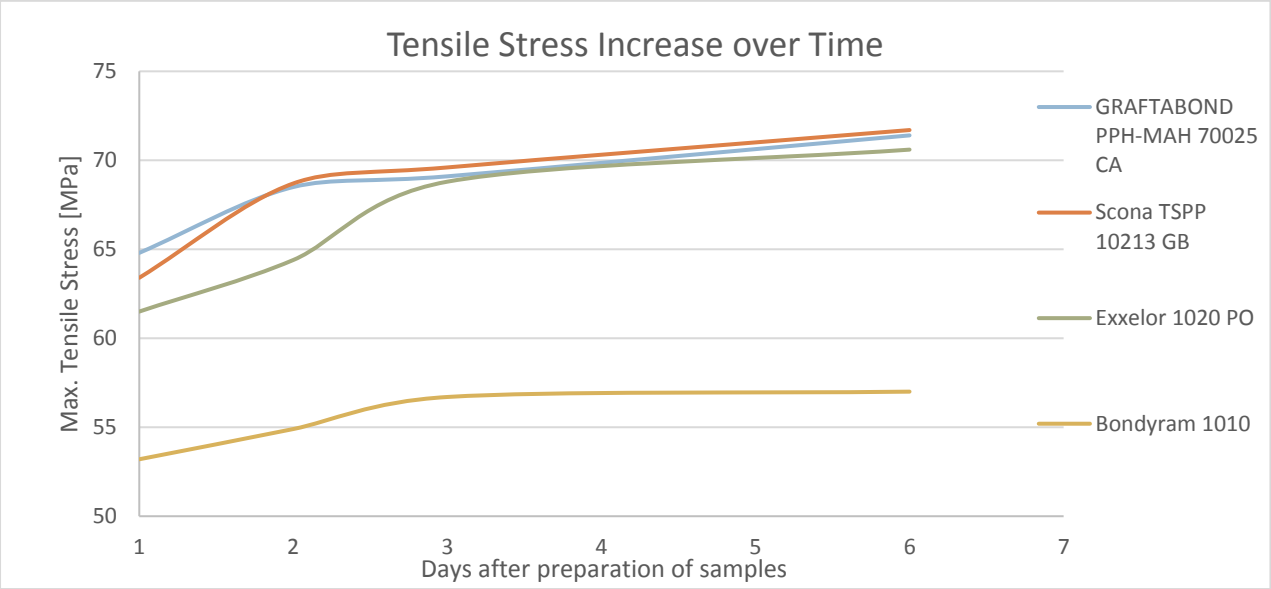
Coupling agent used	Max. Tensile stress [MPa]	Elongation at Break [%]	Charpy Impact Strength [kJ/m²]
No Coupling Agent	40,2	3,43	0,8
Bondyram 1001	57,0	3,8	0,93
Exxelor PO 1020	70,6	4,9	1,45
Scona TSPP 10213 GB	71,1	5,2	1,9
GRAFTABOND PPH-MAH 70025 CA	71,4	5,1	2,25



GRAFT POLYMER D.O.O.
Emonska Cesta 2, Ljubljana Slovenia
Company Num. 8056200000, VAT. SI 30561345
Phone Num. +38640867937
office@graftpolymer.com

GRAFT POLYMER UK LTD
Central Working Victoria Eccleston Yards 25,
Eccleston Pl, London, UK, SW1W 9NF.
Company Num. 10776788, VAT. 281712016
www.graftpolymer.com

Because of crystallization properties of PP, we examined how tensile properties change over time. We measured tensile properties of prepared composites on the day they were injection molded and during the 6 days after that.



CONCLUSIONS

- When using coupling agents, tensile properties and Charpy impact strength all increase considerably
- Measured properties are very similar between GRAFTABOND PPH-MAH 70025 CA and Scona TSPP 10213 GB, with Exxelor PO 1020 not far behind. Bondyram 1001 has the worst performance, but still better than no coupling agent
- When using GRAFTABOND PPH-MAH 70025 CA, tensile strength increases by up to 80%, elongation by up to 50% and Charpy impact strength by up to 180%
- Due to the crystallization of PP, tensile properties continue to increase after preparing the composites
- GRAFTABOND PPH-MAH 70025 CA offers the best color and properties together, and it is made in a one-step process with extrusion only. (granules can be provided with underwater pelletizing)

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