

IMPACT MODIFICATION OF POLY-4-METHYL-PENTENE-1 AND POLYPROPYLENE BY CONVENTIONAL AND NON-CONVENTIONAL ELASTOMERS

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Introduction: Poly-4-methyl-pentene-1 (PMP) is a semi-crystalline polymer for special applications requiring high stiffness and heat resistance. Even more than polypropylene (PP) homopolymers it suffers from a lack of impact strength. The relative effect of different elastomer types for impact modification was investigated for both PMP and PP.

Methods: Basic characterisation consisted of tensile and Charpy notched impact measurements. To gain insight into the related mechanisms both the morphology (via TEM) and the solid-state dynamic mechanical behaviour was investigated.

Results: Conventional impact modifiers, such as commercial ethylene/propylene^{1,2,3} (e.g. Vistamaxx) and ethylene/octene⁴-elastomers (e.g. Engage), were found to result in an acceptable stiffness/impact balance for both base polymer types. In addition a silane-crosslinkable LDPE/acrylate copolymer (Visico) was tested as a non-conventional impact modifier^{5,6} which appears to deliver good impact properties for the case of PP only. Morphology investigations and the solid-state dynamic mechanical behaviour delivered some insight into the related mechanisms.

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Table 1: Stiffness-impact-balance for the PMP and PP blends.

<i>Blend components</i>	<i>Tensile Modulus ISO 527 [MPa]</i>	<i>Charpy ISO 179 1eA 23°C [kJ/m²]</i>
PMP	1541	1.0
PMP + 30 wt-% Visico LE4481	888	1.9
PMP + 30 wt-% Vistamaxx 1120	1019	14.7
PMP + 30 wt-% Engage 8411	1004	5.3
PP	680	6.2
PP + 25 wt-% Visico LE4481	482	19.2

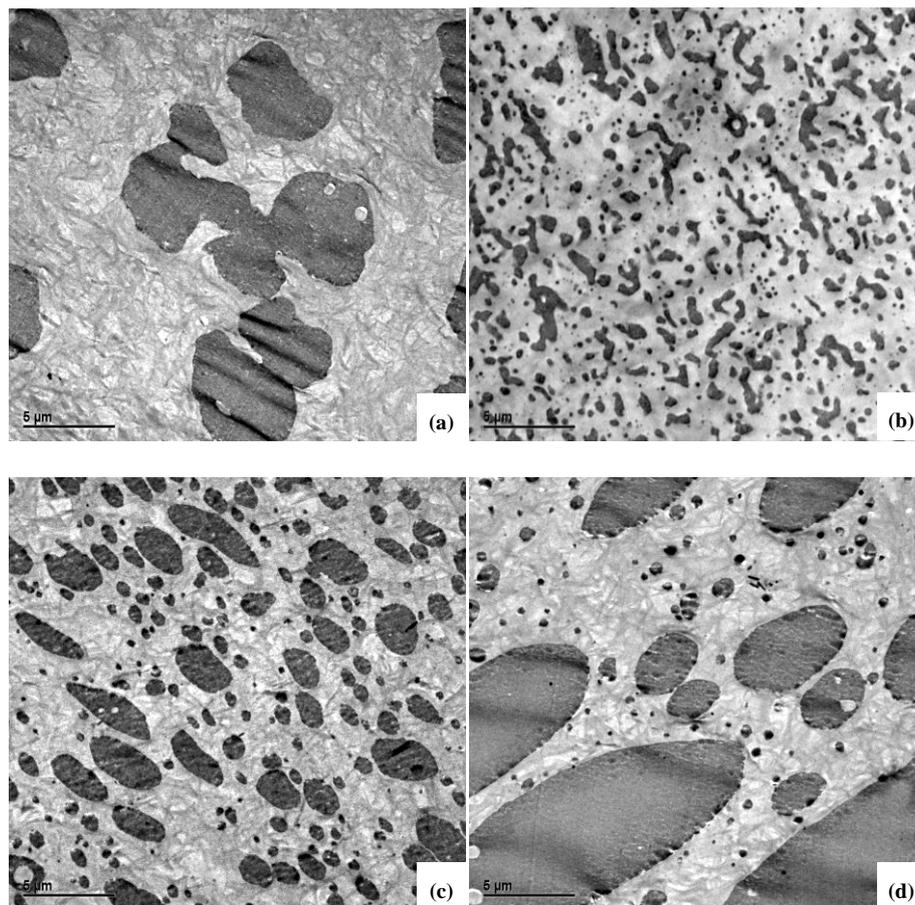


Figure 1: TEM micrographs of the blends: (a) PMP + 30% Visico, (b) PP + 30% Visico, (c) PMP + 30% Vistamaxx and (c) PMP + 30% Engage. The observed surface was perpendicular to the flow direction and the scale bar represents 5 μm .