



CONTINUOUS ANIONIC POLYMERISATION OF A NEW IMPACT MODIFIER FOR PA 6

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Former studies showed that blending PA 6 with an anionic polymerized PA 6/polyether-blockcopolymer (PA6-copo) enhances the impact strength significantly. Compared to pure PA 6, the incorporation of 30 mass-% PA 6-copo increases the notched impact strength by 1200 % from 5 to about 73 kJ/m², whereas the Young's modulus decreases only moderately about 25 % from 2.8 to 2.0 GPa. Furthermore, in comparison to a PA 6/EPDM-g-MA blend, the new PA 6/PA 6-copo blend reveals a low melt viscosity and shrinkage and no need of a coupling agent. Usually the PA 6-copo is polymerised by a reaction injection moulding (RIM) process. To use it as an impact modifier, the semi-finished product has to be milled in a time exhaustive and cost expensive process. This study shows a novel approach to avoid milling and synthesise PA 6-copos by means of a continuous anionic polymerisation in a twin screw extruder. The anionic RIM-reaction had to be optimized for the reactive extrusion (REX) of PA 6-REX-copo. Results show that blends with the two impact modifiers made by RIM and REX are very similar in terms of mechanical and morphological properties. The notched impact strength of the PA 6/PA 6-REX-copo blends increases to values above 100 kJ/m² at the same concentration while the Young's modulus only decreases moderately to 1.9 GPa. By adjusting the polyether content, it is possible to control the properties of the PA 6-REX-copo. Morphological studies (TEM and AFM) show that block copolymers with a polyether content of 10 and 20 mass-% are still thermoplastic. The amount of polyether triol is not high enough for many cross linkages. The copolymers with 30 and 40 mass-% polyether reveal an elastomeric behaviour. TEM showed a similar cross-linked structure, which was found in PA 6-RIM-copo with 30 and 40 mass-%.