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Single polymer laminate composites by compression molding of knitted textiles and microparticles of polyamide 6: Preparation and structure-properties relationship

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Abstract

Knitted reinforced single polymer laminate composites based on polyamide 6 ($KSPCs_{PA6}$) are produced by compression molding of polyamide 6 microparticles (MPS_{PA6}) powder-coating annealed PA6 Rib or Jersey knitted textile structures. The MPS_{PA6} are synthesized by solution/precipitation activated anionic ring-opening polymerization of ϵ -caprolactam. The tensile properties of $KSPCs_{PA6}$ are studied in relation to the knitted reinforcement architecture, fiber volume fraction, ply orientation and stacking orders. The tensile stiffness and strength of the newly prepared $KSPCs_{PA6}$ with fiber content of 15% show significant improvements as compared to the neat anionic PA6 matrix and to commercial hydrolytic PA6 (HPA6). The mechanical behavior of the $KSPCs_{PA6}$ is correlated with the geometry parameters of the knitted reinforcements, the polymorph content of the samples and their crystallinity indexes determined by differential scanning calorimetry and wide-angle X-ray diffraction. The fracture behavior of $KSPCs_{PA6}$ is investigated by electron microscopy complemented by simulation studies.

Keywords: Single polymer composite, Polyamide 6, knitted textile reinforcements, tensile properties.

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