Accepted Manuscript

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

Shafagh.D. Tohidi, Ana Maria Rocha, Nadya V. Dencheva, Zlatan Denchev

PII: S1359-835X(18)30097-6
DOI: https://doi.org/10.1016/j.compositesa.2018.03.003
Reference: JCOMA 4960

To appear in: *Composites: Part A*

Received Date: 10 October 2017
Revised Date: 1 March 2018
Accepted Date: 2 March 2018

Please cite this article as: Tohidi, Shafagh.D., Maria Rocha, A., Dencheva, N.V., Denchev, Z., Single polymer laminate composites by compression molding of knitted textiles and microparticles of polyamide 6: Preparation and structure-properties relationship, *Composites: Part A* (2018), doi: https://doi.org/10.1016/j.compositesa.2018.03.003

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

Shafagh. D. Tohidi[a], Ana Maria Rocha[a*], Nadya V. Dencheva[b] , Zlatan Denchev[b].

[a)] *Center of Textile Science and Technology (2C2T), Department of Textile Engineering, University of Minho, Guimarães, Portugal.*
[b)] *i3N - Institute for Polymers and Composites, Department of Polymer Engineering, University of Minho, Guimarães, Portugal.*

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.

* Address correspondence to this author at the Center of Textile Science and Technology (2C2T), Department of Textile Engineering, University of Minho, Guimarães, Portugal.; Tel: +351-253510290; E-mail: amrocha@det.uminho.pt.