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Influence of temperature in the mechanical properties of high performance PA 6.6 synthetic fiber after dipping process

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High performance polyamide 6.6 synthetic fibers are used in engineering products such as tires, belts, hoses and pneumatic springs [1]. The study of fibers mechanical properties is of great relevance for characterization and understanding of the causes as well the consequences of failures of those products. The fiber performance, in general, has to be analyzed in each step of the thermo, chemical and mechanical treatments to which is submitted. The dipping process is the chemical treatment to improve the adhesion properties between fiber and rubber. This process occurs around temperatures of 220°C and exposure times of 30 minutes. In this study polyamide 6.6 fibers were selected before and after dipping process, and have its mechanical properties analyzed [2]. Tensile strength tests have been carried out to evaluate the mechanical properties and the results showed an approximately 8.6% loss of resistance and an elongation improvement corresponding to approximately 14.3% (see table I and fig. 1). The technical literature has confirmed the loss of resistance results [3] (see fig. 2)

Table I: Mechanical properties

Material	Mechanical Strength (Kg)					Ave	(%)	Elongation (%)					Ave	(%)
Normal fiber	17.0	17.8	17.8	17.4	17.1	17.4	- 8.6	19.7	19.4	19.7	20.7	18.4	19.58	+ 14.4
Dipped fiber	16.0	16.3	16.0	15.5	15.8	15.9		21.5	23.0	23.1	22.1	22.3	22.40	

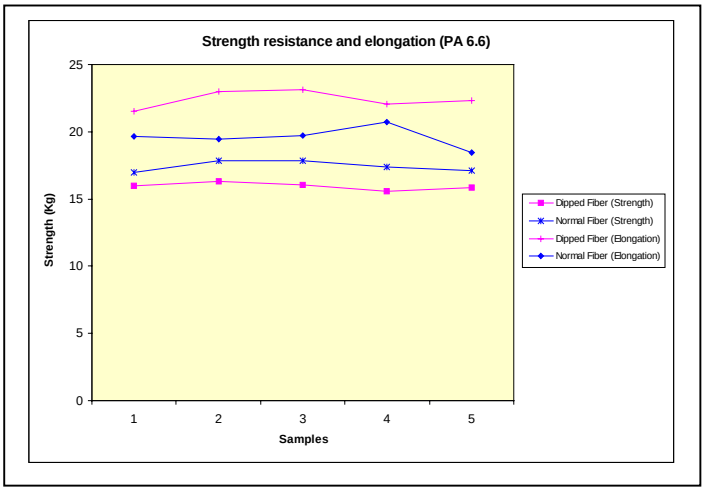

Figure 1: Mechanical properties of PA 6.6

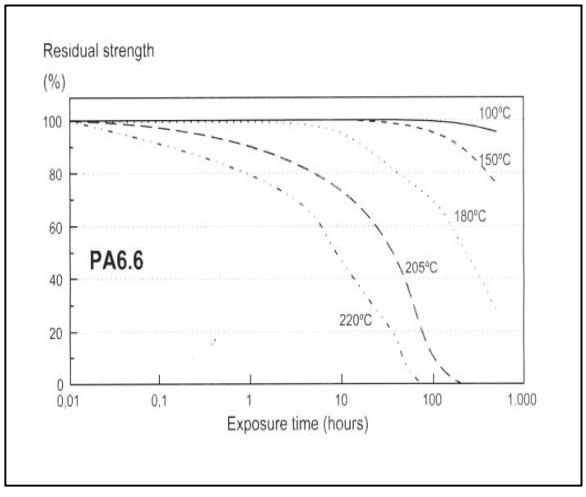

Figure 2: Thermo degradation of PA 6.6

[1] Goodyear Conveyor Belt Products version 1.0: Handbook of Conveyor & Elevator Belting. USA, 2000. 1 Cd ROM.
[2] Kordsa Global Industrial: Yarn and Tire Cord Fabric Manufacturing and Trading Inc. 22 dec. 2006.
[3] Acordis Industrial Fibers: Chemical and Thermal Resistance of Textile Reinforcing Materials, Netherlands, p. 1-28, Jul. 1999.