



EFFECTS OF TTNT ADDITION IN WEAR BEHAVIOR OF POLYAMIDE 11

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Abstract: Polyamides (PA) are engineering polymers that are facing increasingly use in a wide variety of fields. Besides PA usual characteristics, such as high toughness, considerable tensile strength, low density and ease of processing, tribological performance is considered a key factor for its widespread applications. Polymer composite materials are being introduced into several industrial sectors due to the possibility of maximizing mechanical properties while preserving the intrinsic properties of the polymer. As a result of its high aspect ratio, which implies a high specific surface area, thus optimizing final properties, special attention has been given to one-dimensional nanostructures. The unique physicochemical properties of the titania nanostructure combined with its peculiar morphology, make titanate nanotubes (TTNT) a promising useful nanoreinforcement. TTNT morphology and residual sodium content are dependent on the synthesis condition and washing step. Due to compatible problems with polymer matrix, TTNT surface can also be modified to maximize reinforcement effect. Although the improvements of mechanical properties in polymers by incorporation of nanomaterials have been extensively studied, there is still a gap of knowledge on how nanostructures can affect tribological behavior. Therefore the present study had the objective to study the wear behavior of PA 11 and its nanocomposites. The effects of TTNT in wear performance were analyzed and contributions of TTNT loading, functionalization and sodium content were highlighted. Wear resistance could be improved above 50% with TTNT addition. Sodium content proved to be significant to wear rate. Although low addition of TTNT (0.5wt%) promoted an increase in wear resistance, higher loadings (1.0wt% and 2.0wt%) did not show the same effect, even in functionalized combinations. Maximum wear resistance was reached by a low addition of TTTNT (0.5wt%) in samples functionalized without a processing washing step, i.e., with high sodium content.

Keywords: polyamide 11, titanate nanotube, wear