Rheological Model for Describing Spunlace Nonwoven Behavior

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Abstract : Nonwoven structures have a range of applications which include Medical, filtration, geotextile and recently this unconventional fabric is finding a niche in fashion apparel. In this paper, a modified form of Vangheluwe rheological model is used to describe the mechanical behavior of nonwovens fabrics in uniaxial tension. This model is an association in parallel of three Maxwell elements characterized by damping coefficients η_1, η_2 and η_3 and E_1, E_2, E_3 elastic modulus and a nonlinear spring C. The model is verified experimentally with two types of nonwovens (50% viscose /50% Polyester) and (40% viscose/60% Polyester) and a range of three square weights values. Comparative analysis of the theoretical model and the experimental results of tensile test proofs a high correlation between them. The proposed model can fairly well replicate the behavior of nonwoven fabrics during relaxation and sample traction. This allowed us to predict the mechanical behavior in tension and relaxation of fabrics starting only from their technical parameters (composition and weight).

Keywords : mechanical behavior, tensile strength, relaxation, rheological model
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