

VISCOELASTIC EFFECTS IN ELASTIC MODULUS MEASUREMENT USING DEPTH-SENSING INDENTATION

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Abstract : The nanoindentation test is used to determine the viscoelastic parameters of a thermoplastic polymer at ambient temperature. The aim of the study is to obtain a mean representative value taking into account the influence of the viscosity on the elastic modulus of the polypropylene. For that, Berkovich indenter has been chosen and applied load equal to 100mN. We used polypropylene as a prototype of viscoplastic material, having a creep more important than the others thermoplastic polymers. It was found that, during nanoindentation, the Young's modulus estimated by the Oliver-Pharr method is several times higher than that which is suitable. The Pile-up and viscoelasticity are usually at the cause of this failure and an analysis of their influences is attempted in this work. The loading and unloading curve obtained from FE simulation results by the nanoindentation test is then undertaken to complete the work. The various results have enabled to analyze the influence of viscosity on the elastic modulus of the polypropylene matrix.

Keywords : thermoplastic polymer, Nanoindentation, constitutive behaviour, Finite Elements