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EXPERIMENTAL AND FINITE ELEMENT ANALYSIS OF THE TEMPERATURE EFFECT ON THE BEHAVIOUR OF POLYMERS DURING HIGH PRESSURE TORSION PROCESS

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The high pressure torsion (HPT) is an efficient process to obtain enhanced microstructures via super-plastic deformation. In view of its optimization, it is of prime importance to assess the relationships between processing conditions and material flow. More precisely, detailed knowledge of the plastic strain distribution in the deformed material in relation to HPT processing variables is very useful. In this context, the present work is focused to highlight the effects of the temperature and the sample thickness on the plastic strain distribution into the deformed material during HPT process. To this end, the material parameters of an elasto-viscoplastic phenomenological model were derived from compressive tests at different temperatures and strain rates on a typical thermoplastic polymer (high density polyethylene (HDPE)). The distribution of the equivalent plastic strain, the pressing force and the torque required were analyzed. Recommendations on process conditions were proclaimed at the end of this work.

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