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MODIFICATION OF FE2O3 AND ITS EFFECT ON THE THERMAL AND MECHANICAL PROPERTIES OF SILICONE RUBBER

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Flow of a rubber compound was studied in an axisymmetric die. The flow was considered to be laminar and non-Newtonian. Rheological behavior of the compound was expressed using three different constitutive models. Two models were pure viscous models namely power-law and Carreau, however the third one was Criminale-Ericksen-Fillbey (CEF) equation to take into account viscoelastic behavior of the compound. Finite element method was used for this study and standard Galerkin scheme was chosen. Flow equations were discretized using continuous penalty method and isoparametric interpolations were used for field and geometry variables. Due to axisymmetry of the geometry and to reduce computations, the flow equations were obtained in two-dimensional cylindrical coordinate system. The geometry of the die was meshed using 9-node quadrilateral elements. The matrix equation obtained by continuous penalty was solved using a frontal routine and in order to overcome the non-linearity of the problem Picard's iteration method was applied. A NR/SBR compound of 40/60 composition was prepared on a laboratory two-roll mill and its rheological properties were measured in slit die rheometry. Then the compound was extruded through an axisymmetric die and the pressure at the entrance of the die was measured using a pressure transducer, and the mass flow rate was measured as well. Then simulations were done by implementing the pressure difference obtained from extrusion process using one of the constitutive equations each time and the mass flow rates were computed. In the end, simulation and experimental results were compared to each other and capability of the constitutive models in describing flow behavior of the compound was evaluated. It was revealed that CEF model worked very better in the simulation and its results very closer to the experimental ones than the other two models. This was due to the fact that it can include the partly elastic response of the material in addition to its viscous response.