

عنوان مقاله:

Modification of exponential based hyperelastic strain energy to consider free stress initial configuration and Constitutive modeling

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خلاصه مقاله:

In this research, the exponential stretched based hyperelastic strain energy was modified to provide the unstressed initial configuration. To this end, as the first step, the model was calibrated by the experimental data to find the best material parameters. The fitting results indicated material stability in large deformations and basic loading modes. In the second step, the initial pseudo stress value (ISV) was eliminated from the hyperelastic strain energy using a function of the determinant of the deformation gradient. The modified and unmodified models were implemented in ABAQUS/VUMAT user subroutine and the deformation behavior of the natural rubber and the thermoplastic elastomer was predicted. The results obtained from the modified model represented a better agreement with the experimental data, in comparison to those gained by the unmodified model. In order to present the significance of the unstressed initial configuration in engineering applications, the stenting phenomenon in the atherosclerosis human artery was investigated. It was revealed that a uniform stress distribution could be achieved in the artery using the modified model, thereby reducing the possibility of tearing and restenosis.

کلمات کلیدی:

Hyperelastic, natural rubber, thermoplastic elastomer, unstressed configuration, VUMAT, Stability

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