

## **A Nonlinear Visco-Hyper Elastic Constitutive Model for Modelling Behavior of Polyurea at Large Deformations**

**Authors :** Shank Kulkarni, Alireza Tabarraei

**Abstract :** The fantastic properties of polyurea such as flexibility, durability, and chemical resistance have brought it a wide range of application in various industries. Effective prediction of the response of polyurea under different loading and environmental conditions necessitates the development of an accurate constitutive model. Similar to most polymers, the behavior of polyurea depends on both strain and strain rate. Therefore, the constitutive model should be able to capture both these effects on the response of polyurea. To achieve this objective, in this paper, a nonlinear hyper-viscoelastic constitutive model is developed by the superposition of a hyperelastic and a viscoelastic model. The proposed constitutive model can capture the behavior of polyurea under compressive loading conditions at various strain rates. Four parameter Ogden model and Mooney Rivlin model are used to modeling the hyperelastic behavior of polyurea. The viscoelastic behavior is modeled using both a three-parameter standard linear solid (SLS) model and a K-BKZ model. Comparison of the modeling results with experiments shows that Ogden and SLS model can more accurately predict the behavior of polyurea. The material parameters of the model are found by curve fitting of the proposed model to the uniaxial compression test data. The proposed model can closely reproduce the stress-strain behavior of polyurea for strain rates up to 6500 /s.

**Keywords :** constitutive modelling, ogden model, polyurea, SLS model, uniaxial compression test

**Conference Title :** ICCM 2018 : International Conference on Computational Mechanics

**Conference Location :** Venice, Italy

**Conference Dates :** August 13-14, 2018