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**Constitutive modeling of size effect on deformation behaviors of amorphous polymers in  
micro-scaled deformation**

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**Abstract:**

With the advantages of high-formability, low-cost and unique physical properties, polymers have been widely used in microforming of polymeric components for a large scale of applications in many fields including micro-optics, microfluidic and sensors, etc. In micro-scale, the deformation behaviors of polymers are observed to be size-dependent. Conventional constitutive models of polymers, however, cannot predict and represent those size-dependent behaviors well. To address this issue, a constitutive model with consideration of size effect for amorphous polymers in micro-scale was developed in this research. Firstly, on the basis of the couple stress theory, the impact of rotational gradients was taken into consideration and a strain gradient “elastic-viscoplastic” constitutive model was proposed to quantitatively describe the size-dependent behaviors of amorphous polymers in micro-scale.

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