Macroscopic Constitutive Model for Hyperelastic Materials and Its Post-fit Version

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Abstract

Hyperelastic materials exhibit excellent mechanical properties and have been widely applied in engineering. To accurately calculate the large deformation response of hyperelastic materials, this study reviews eight commonly used macroscopic hyperelastic constitutive models and presents fitting methods. The stress-strain relationships for Mooney-Rivlin, Neo-Hookean, Yeoh, Ogden, Arruda-Boyce, Van der Waals, and HyperFoam models under uniaxial tension, equibiaxial tension, pure shear, and volumetric compression are derived. Linear least squares and Levenberg-Marquardt methods are employed to fit linear and nonlinear constitutive models, respectively. The validity of the constitutive models and fitting methods is verified through comparison with experimental data from uniaxial tensile tests.

Full Text

Preamble

The provided text consists primarily of OCR artifacts, encoding errors, and corrupted characters. No coherent Chinese academic content suitable for translation could be identified.

Figures

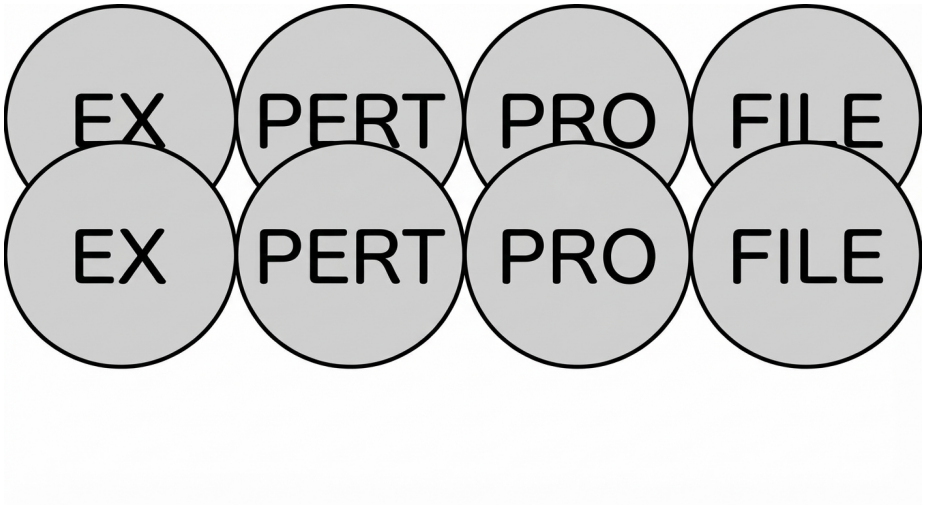


Figure 1: Figure 2

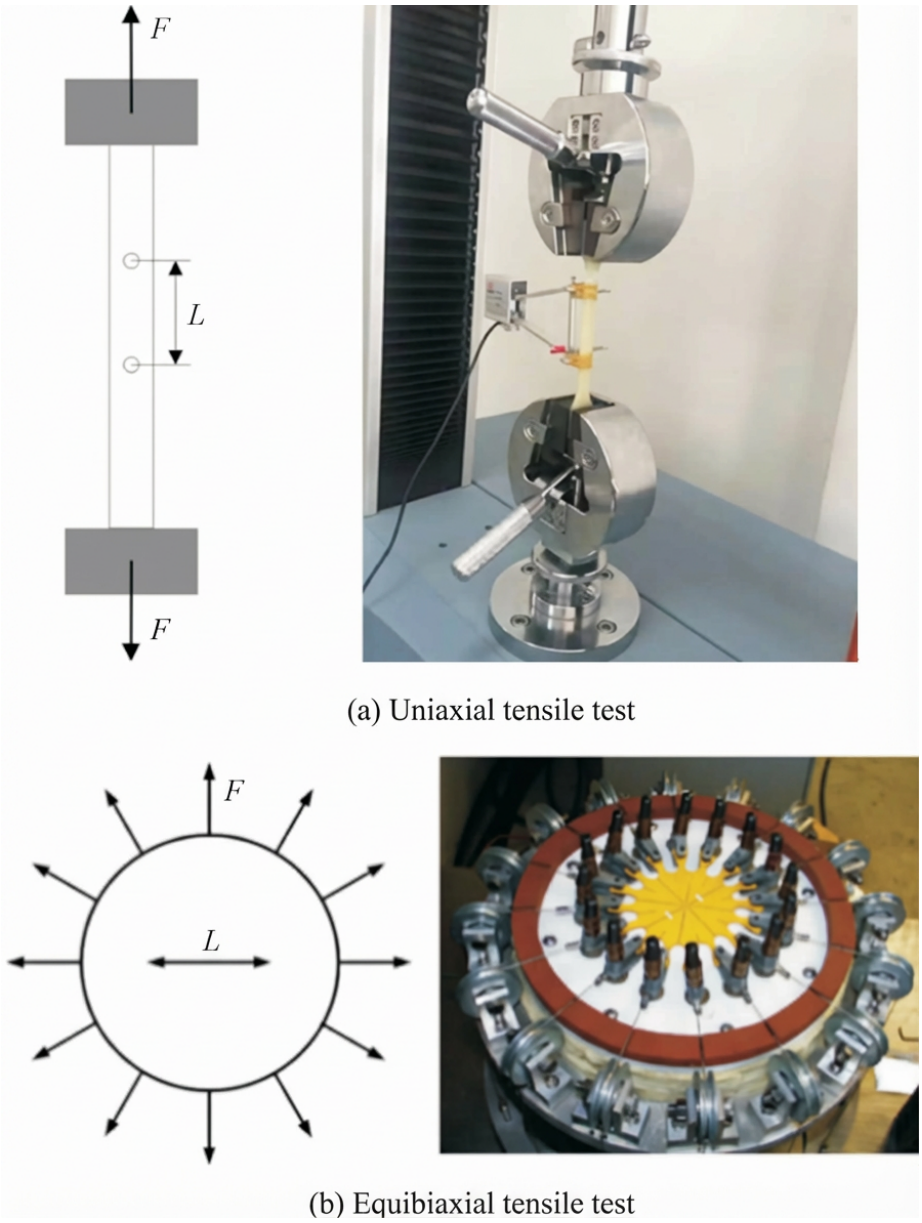
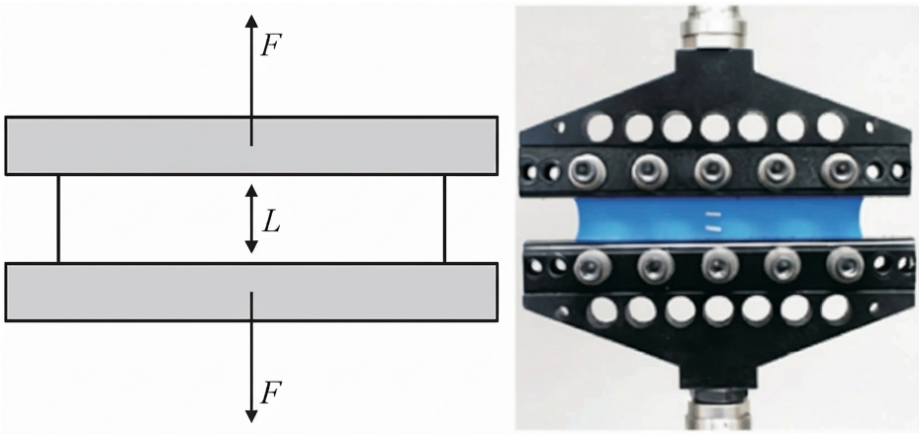
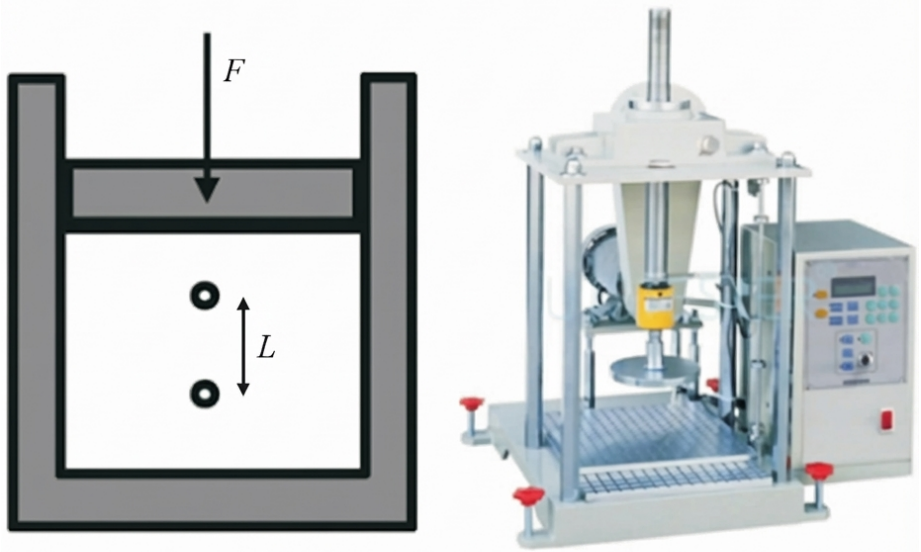


Figure 2: Figure 3



(c) Pure shear test



(d) Volumetric compression test

Figure 3: Figure 4

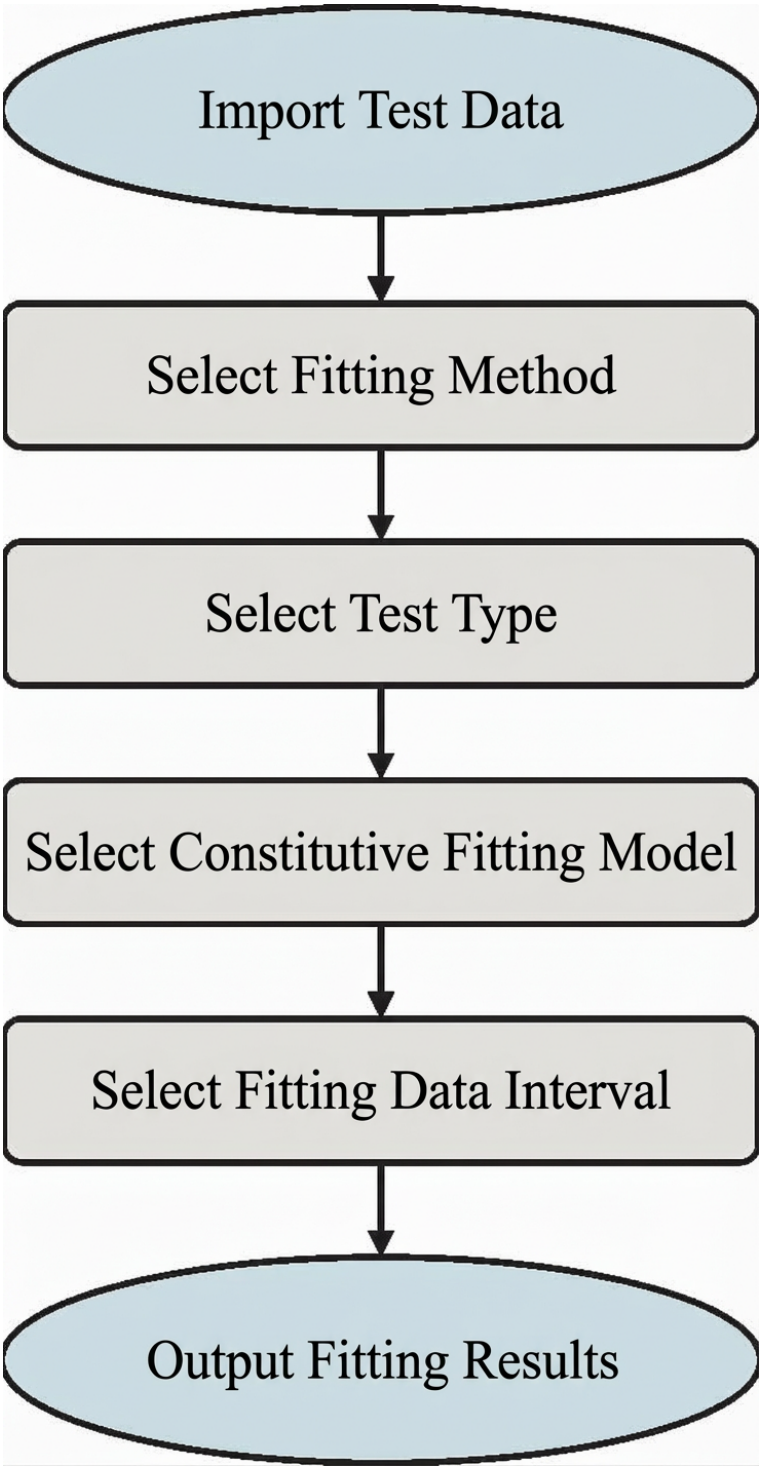


Figure 4: Figure 6

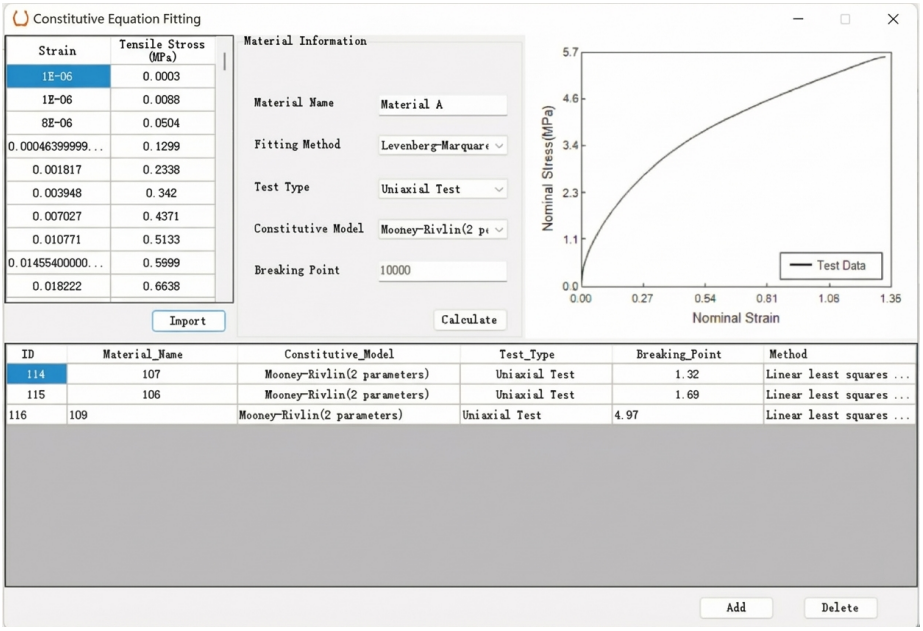


Figure 5: Figure 8

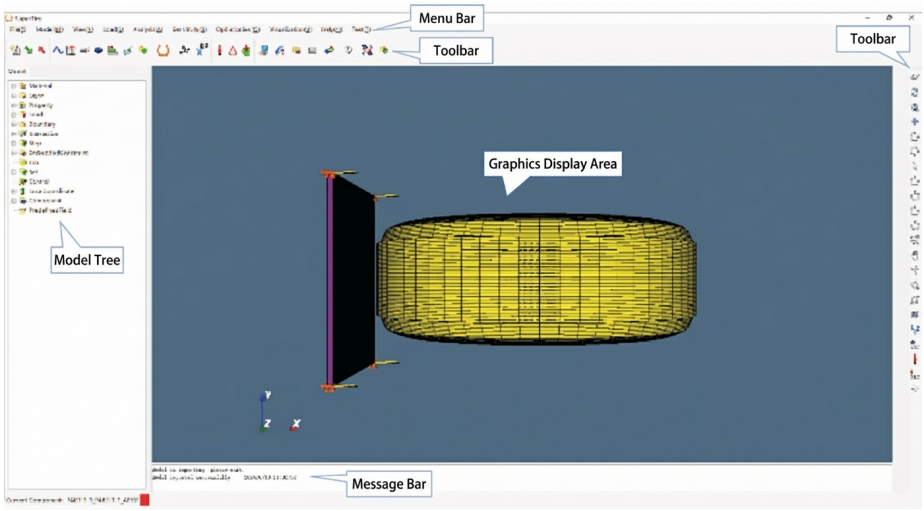


Figure 6: Figure 9