Measurement of the damage process in highly filled elastomers

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Abstract

Solid propellants are made of elastomers filled with rigid polyhedral particles up to 75% volume fraction. Their mechanical behaviour needs to be understood and predicted in order to use them in rocket motors. Upon loading two damage mechanisms appear in these composites: matrix/filler debonding and matrix cracking. Since both the particles and the elastomer are incompressible materials, the damaging process can be directly related to the volume variation of the composite upon loading. In this contribution, the volume variations of a model highly filled elastomer upon uniaxial loading are measured with three techniques: gas dilatometry, video-extensometry and tomography. The settings and the results interpretation method of the tomography measurements are emphasized. The results obtained with the three techniques are compared and the complementary information yielded by the three measurement techniques on the two damaging processes is discussed.

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