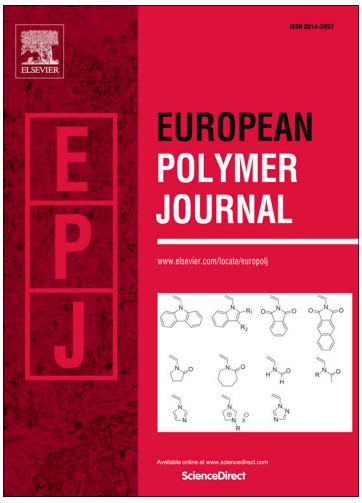

Stored energy accompanying cyclic deformation of filled rubber

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Abstract

The hysteresis observed in the mechanical response of filled rubbers is classically assumed to be due to viscosity. In this study, a complete energy balance is carried out during cyclic deformation of a filled acrylonitrile-butadiene rubber. Results show that for the studied material, viscosity is not the preponderant contribution to the hysteresis loop: the mechanical energy brought to the material is not entirely dissipated into heat but *a contrario* is mainly used by the material to change its microstructure. Moreover, no significant hysteresis loop is observed in the unfilled material. Hence, the filler network stores elastic energy during its deformation, leading to a change in the internal energy. The higher the stretch applied, the higher the relative stored energy, but the higher the stretch rate applied, the lower the relative stored energy in the filler network. This has been evidenced by defining a