

Accepted Manuscript

Stored energy accompanying cyclic deformation of filled rubber

M.T. Loukil, G. Corvec, E. Robin, M. Miroir, J.-B. Le Cam, P. Garnier

PII: S0014-3057(17)31432-5

DOI: <https://doi.org/10.1016/j.eurpolymj.2017.11.035>

Reference: EPJ 8169

To appear in: *European Polymer Journal*

Received Date: 16 August 2017

Accepted Date: 23 November 2017

Please cite this article as: Loukil, M.T., Corvec, G., Robin, E., Miroir, M., Le Cam, J.-B., Garnier, P., Stored energy accompanying cyclic deformation of filled rubber, *European Polymer Journal* (2017), doi: <https://doi.org/10.1016/j.eurpolymj.2017.11.035>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Stored energy accompanying cyclic deformation of filled rubber

M.T. Loukil^{a,b} G. Corvec^{b,c} E. Robin^{b,c} M. Miroir^{b,c}

J.-B. Le Cam^{b,c,1} P. Garnier^a

^a*PCM Technologies S.A.S., Rue René Moineau, 49123 Champtocé-sur-Loire - France*

^b*Université de Rennes 1, Institut de Physique UMR 6251 CNRS/Université de Rennes 1, Campus de Beaulieu, Bât. 10B, 35042 Rennes Cedex, France.*

^c*LC-DRIME, Joint Research Laboratory, Cooper Standard - Institut de Physique UMR 6251, Campus de Beaulieu, Bât. 10B, 35042 Rennes Cedex, France.*

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

Download English Version:

<https://daneshyari.com/en/article/7804137>

Download Persian Version:

<https://daneshyari.com/article/7804137>

[Daneshyari.com](https://daneshyari.com)