

'Determination of the transfer constant for copolymerisation in the presence of a reactive substrate'

R. A. M. Thomson and C. K. Ong, *Polymer*, 1980, **21**, 470

We have noted that incorrect versions of equations (4) and (6) were submitted in the manuscript of the above paper and escaped subsequent correction. The final equation and the substance of the paper are, however, unaffected. The intermediate equations should read:—

$$\left(\frac{r_A C_A}{r_A - 1} + \frac{r_B C_B}{r_B - 1}\right) \ln \gamma = \ln \frac{[S]}{[S]_0} - \left(\frac{r_A C_A}{r_A - 1}\right) \frac{\Delta U}{U_0} \quad (4)$$

and

$$\left| \frac{r_A C_A}{r_A - 1} \right| < \left| \frac{r_B C_B}{r_B - 1} \right| \quad (6)$$

$$< \left| \frac{U_0}{\Delta U} \ln \frac{[S]}{[S]_0} \right|$$

It should also be noted that U and U_0 have been inverted in equation (1). The authors apologize for these errors.

'The orientation hardening of PVC'

Polymer 1978, **19**, 681, Figure 5

In presenting the relation between true stress and (true) strain in plane-strain compression (Figure 5 of the above paper) we plotted the true stress against the strain parameter $\lambda - 1/\lambda^3$, where λ is the compression ratio. However, the equation given for the true stress (force per unit strained area), namely,

$$S = 2(K_{\perp} + K_{\parallel})(\lambda - 1/\lambda^3) \quad (1)$$

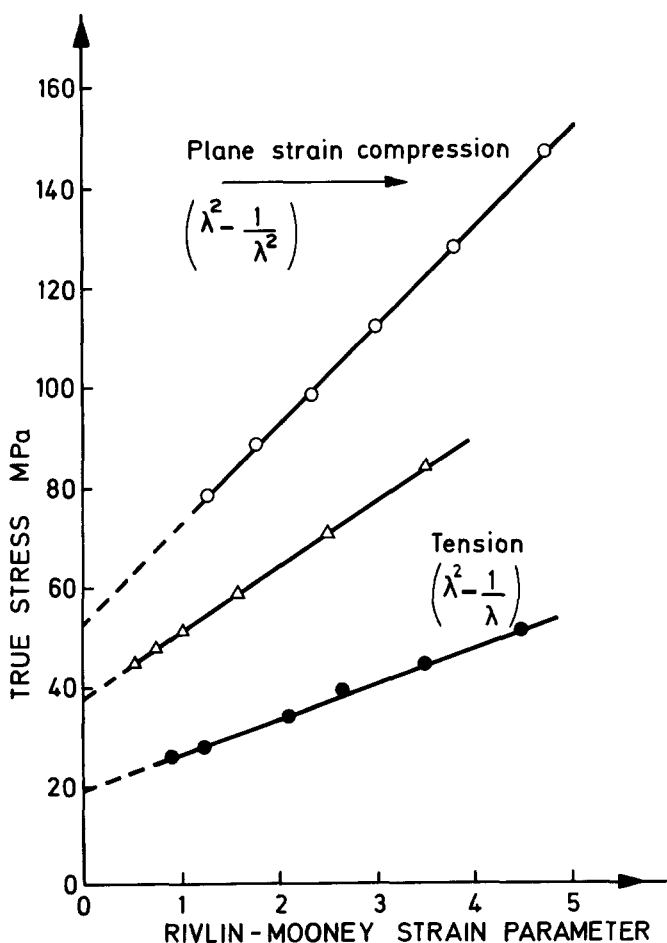


Figure 5 Use of rubber elasticity relations to describe the strain hardening of PVC. True stress is plotted against the relevant strain parameter. ○, x, Rigid quenched PVC; ●, low plasticized PVC

is incorrect, and is in fact the force per unit unstrained area ("engineering" stress). The true stress is:

$$S = 2(K_{\perp} + K_{\parallel})(\lambda^2 - 1/\lambda^2) \quad (2)$$

The error arose from the presumption that because the surface area in the plane-strain compression test is constant it was unnecessary to distinguish between the true stress and the engineering stress (p. 678 of original paper). This, however, is erroneous, because the volume of material under stress decreases, hence the force cannot be obtained by differentiation of the work W per unit volume with respect to λ , as in the case of simple extension.

Plane-strain compression is formally equivalent to pure shear, for which a detailed analysis on the basis of the statistical theory ($K_{\parallel} = 0$) has been given¹. The resultant true stress in the principal direction of strain is found to be:

$$S = 2K(\lambda^2 - 1/\lambda^2) \quad (3)$$

An identical treatment using the Mooney form of strain-energy function leads directly to the result (2).

The appropriate strain parameter corresponding to either the statistical theory or to the Mooney equation should therefore be $\lambda^2 - 1/\lambda^2$ rather than $\lambda - 1/\lambda^3$.

The accompanying revised Figure 5 which includes the unchanged lines for tension shows the results obtained on introducing this modification. They show an improved representation of the experimental results in that the two intercepts on the ordinate are now 52.5 for a plane-strain compression and 37.8 for tension. The resulting ratio of 1.39 agrees (as it should) with the value of 1.37 given elsewhere in the paper.

The net effect of this amendment is thus to strengthen the arguments in favour of using functions derived from the theory of rubber elasticity to describe the strain hardening process in plastics. It should, however, be noted that the slopes of the two lines for quenched PVC are not the same.

We are indebted to Prof. L. R. G. Treloar for calling our attention to this error.

References

- 1 'The Physics of Rubber Elasticity' 3rd Edn. L. R. G. Treloar p 85. Clarendon Press, Oxford, 1975