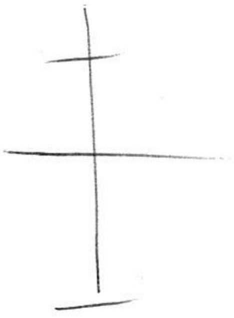


$$\dot{e} = \frac{V_{max}}{l_{at\ v\ max}}.$$

Dear. Phil.

– I was having a look at. Steve's calculation for strain-rate. & I reckon its wrong.

$$\text{if.} \quad A = l.\left(\sqrt{2s\eta + s^2 \ldots}\right),$$

Then maximum speed attained (from SHM). is ωA where ω is nat. frequency.

For the rope $F = \lambda x$. (λ N/m spring const).
or $mg = \lambda x$.

but Steve defines x as. sL.

So. $\lambda = \dfrac{mg}{sL}$. and. we know $\omega = \sqrt{\dfrac{\lambda}{m}}$.

~~So $V_{max} = \sqrt{\frac{g}{sL}}$~~

$$\varepsilon = \frac{\sqrt{\frac{g}{sL}}\ \cancel{l}.\left(\sqrt{2s\eta + s^2}\right.}{\cancel{l}\,(1+s)}$$

$$\epsilon = \sqrt{\frac{g}{L}}$$

$$mg = \lambda x = \lambda s l$$

$$\therefore \lambda = \frac{mg}{sl}$$

$$\omega = \sqrt{\frac{\lambda}{m}} \quad \text{from SHM}$$

$$\therefore \omega = \sqrt{\frac{g}{sl}}$$

$$V_{max} = \omega . A = l\sqrt{2s\eta + s^2} \times \sqrt{\frac{g}{sl}}$$

$$= \left(l^{\cancel{2}} (2\eta + s) . \frac{g}{\cancel{l}} \right)^{1/2}$$

$$V_{max} = \left[lg(2\eta + s) \right]^{1/2}$$

$$\dot{\varepsilon}_{max} = \frac{V_{max}}{l(1+s)} = \left[\frac{lg(2\eta+s)}{l^2(1+s)^2} \right]^{1/2} = \left(\frac{g}{l} . \frac{(2\eta+s)}{(1+s^2)} \right)^{1/2}$$

~~V_{max}~~ l at V_{max} is $l(1+s)$ because V_{max} is at centre of SHM.

now the $\dot{\varepsilon}$ we want is the $\dot{\varepsilon}$ at max load, but we know this is going to be less than $\dot{\varepsilon}_{max}$. BUT $\dot{\varepsilon}$ at max. load is ZERO!!

MAR 1984

$G^* = G_1 + i.G_2$ $\qquad \tan\delta = G_2/G_1$

$$G_1(\omega) = [G_r] + \int_{-\infty}^{+\infty} \frac{H(\tau)\,\omega^2\tau^2}{1+\omega^2\tau^2} \cdot d(\ln\tau)$$

$$G_2(\omega) = \int_{-\infty}^{\infty} \frac{H(\tau)\,\omega\tau}{1+\omega^2\tau^2}\, d(\ln\tau)$$

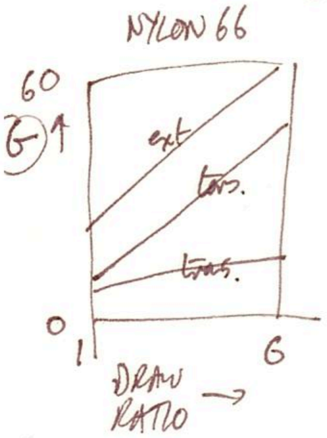
$H(\tau)$ is the relaxation time spectrum

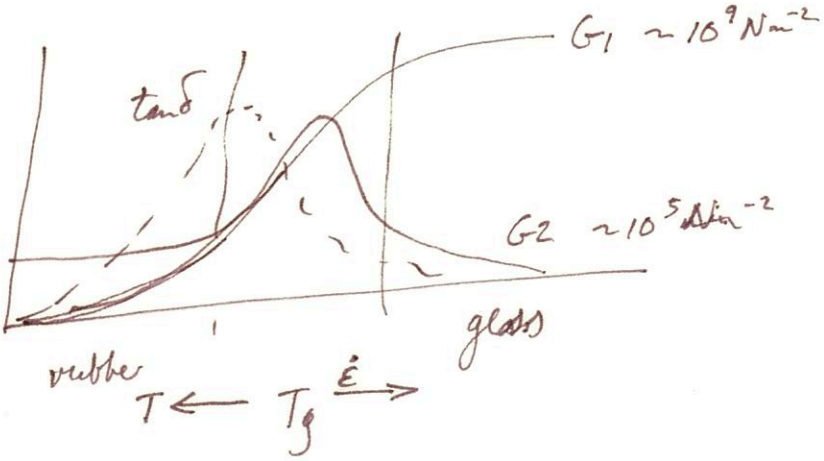
G_1 storage modulus

G_2 loss modulus

energy dissipated per cycle $= \Delta E = \int_0^{2\pi/\omega} \sigma . \frac{d\varepsilon}{dt} . dt$

$$\Delta E = \pi G_2 \varepsilon_0^2$$

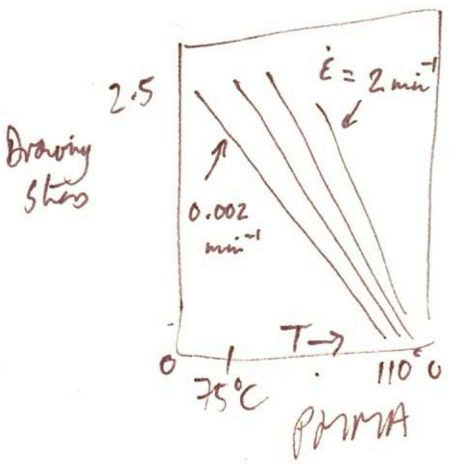




$\varepsilon = \varepsilon_0 \sin\omega t$

$\sigma = \sigma_0 \sin(\omega t + \delta)$

↑ PHASE LAG.



<u>ANYWAY</u>

fibres in ropes are heavily drawn ∴ they are highly crystalline, ∴ T_g is <u>HIGH</u> (~ 250°C for nylon ?!)

ideas of low Molecular Weight plasticizers/impurities leaching out & affecting surface of fibres — which are critical to failure mode!

D. ...?!