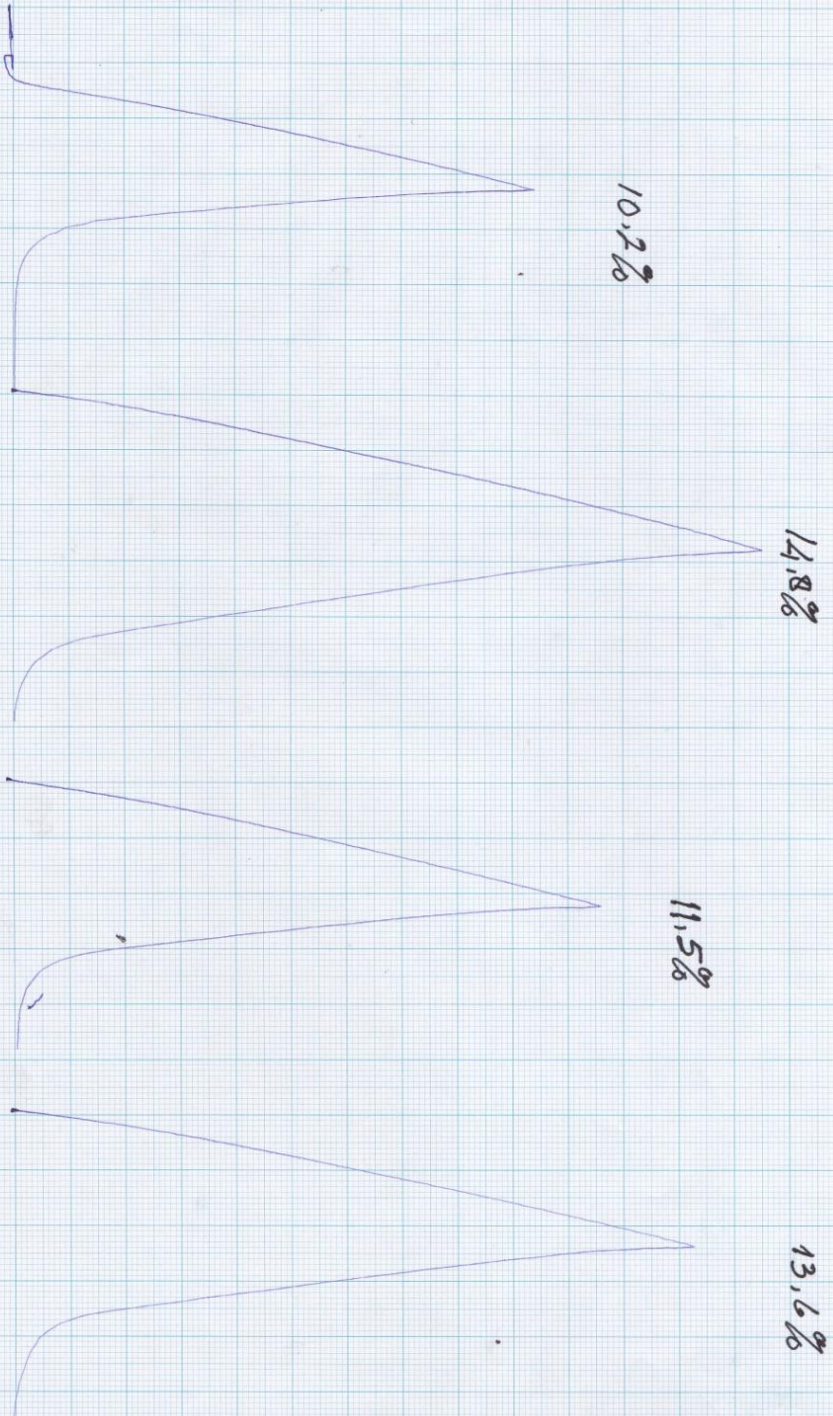


LAMPIRAN

*Beliau agterfasang
2 fem*



Pengujian Tarik

Perhitungan pengujian tarik kopolimer hybrid 1 alam (serat rami) 2 sintetis (fiber) metode *Vacuum Infusion*.



1. Spesimen VI 1

a. Luas penampang specimen VI 1

Diketahui : Tebal spesimen (t) = 1,25 mm

Lebar spesimen (l) = 14,72 mm

Ditanyakan A (Luas penampang spesimen) ?

$$A = t \times l$$

$$= 1,25 \times 14,72$$

$$= 18,4 \text{ mm}^2$$

b. Tegangan spesimen VI 1

$$\sigma = \frac{F}{A}$$

$$F = \frac{13,6}{100} \times 2000 \text{ kg} \times 9,8 \text{ m/s}^2$$

$$F = 2665,6 \text{ N}$$

Maka $\sigma = \frac{F}{A}$

$$\sigma = \frac{2665,6}{18,4}$$

$$\sigma = 144,87 \text{ N/mm}^2$$

c. Regangan spesimen VI 1

$$\varepsilon = \frac{\Delta L}{L}$$

$$\varepsilon = \frac{0,30}{166,85} \times 100$$

$$\varepsilon = 0,180 \%$$

d. Modulus elastisitas spesimen VI 1

$$E = \frac{\sigma}{\varepsilon}$$

$$E = \frac{144,87}{0,180 \%}$$

$$E = 80571,62 \text{ N/mm}^2 = 80,57 \text{ GPa}$$

2. Spesimen VI 2

a. Luas penampang spesimen VI 2

Diketahui : Tebal spesimen (t) = 1,19 mm

Lebar spesimen (l) = 14,72 mm

Ditanyakan A (Luas penampang spesimen) ?

$$\begin{aligned}A &= t \times l \\ &= 1,19 \times 14,72 \\ &= 17,56 \text{ mm}^2\end{aligned}$$

b. Tegangan spesimen VI 2

$$\sigma = \frac{F}{A}$$

$$F = \frac{11,5}{100} \times 2000 \text{ kg} \times 9,8 \text{ m/s}^2$$

$$F = 2254 \text{ N}$$

Maka $\sigma = \frac{F}{A}$

$$\sigma = \frac{2254}{17,56}$$

$$\sigma = 128,33 \text{ N/mm}^2$$

c. Regangan specimen VI 2

$$\varepsilon = \frac{\Delta L}{L}$$

$$\varepsilon = \frac{0,21}{166,87} \times 100$$

$$\varepsilon = 0,126 \%$$

d. Modulus elastisitas specimen VI 2

$$E = \frac{\sigma}{\varepsilon}$$

$$E = \frac{128,33}{0,126 \%}$$

$$E = 101971,68 \text{ N/mm}^2 = 101,97 \text{ GPa}$$

3. Spesimen VI 3

a. Luas penampang specimen VI 3

Diketahui : Tebal spesimen (t) = 1,205 mm

 Lebar spesimen (l) = 14,66 mm

Ditanyakan A (Luas penampang spesimen) ?

$$\begin{aligned}A &= t \times l \\&= 1,205 \times 14,66 \\&= 17,6653 \text{ mm}^2\end{aligned}$$

b. Tegangan specimen VI 3

$$\sigma = \frac{F}{A}$$

$$F = \frac{14,8}{100} \times 2000 \text{ kg} \times 9,8 \text{ m/s}^2$$

$$F = 2900,8 \text{ N}$$

Maka $\sigma = \frac{F}{A}$

$$\sigma = \frac{2900,8}{17,6653}$$

$$\sigma = 164,21 \text{ N/mm}^2$$

c. Regangan specimen VI 3

$$\varepsilon = \frac{\Delta L}{L}$$

$$\varepsilon = \frac{0,29}{168,33} \times 100$$

$$\varepsilon = 0,172 \%$$

d. Modulus elastisitas specimen VI 3

$$E = \frac{\sigma}{\varepsilon}$$

$$E = \frac{164,21}{0,172 \%}$$

$$E = 95314,79 \text{ N/mm}^2 = 95,31 \text{ GPa}$$

4. Spesimen VI 4

a. Luas penampang specimen VI 4

$$\text{Diketahui : Tebal spesimen (t) = 1,13 mm}$$

$$\text{Lebar spesimen (l) = 14,69 mm}$$

Ditanyakan A (Luas penampang spesimen) ?

$$A = t \times l$$

$$= 1,13 \times 14,69$$

$$= 16,59 \text{ mm}^2$$

b. Tegangan spesimen V1 4

$$\sigma = \frac{F}{A}$$

$$F = \frac{10,2}{100} \times 2000 \text{ kg} \times 9,8 \text{ m/s}^2$$

$$F = 1999,2 \text{ N}$$

$$\text{Maka } \sigma = \frac{F}{A}$$

$$\sigma = \frac{1999,2}{16,59}$$

$$\sigma = 120,44 \text{ N/mm}^2$$

c. Regangan specimen V1 4

$$\varepsilon = \frac{\Delta L}{L}$$

$$\varepsilon = \frac{0,16}{166,96} \times 100$$

$$\varepsilon = 0,096\%$$

d. Modulus elastisitas specimen V1 4

$$E = \frac{\sigma}{\varepsilon}$$

$$E = \frac{120,44}{0,096 \%}$$

$$E = 12567,87 \text{ N/mm}^2 = 125,67\text{GPa}$$

5. Nilai tegangan rata-rata keempat spesimen

$$\begin{aligned}\sigma_{(\text{rata-rata})} &= \frac{\sigma_1 + \sigma_2 + \sigma_3 + \sigma_4}{4} \\ &= \frac{144,87 + 128,33 + 164,21 + 120,44}{4} \\ &= 139,46\text{MPa}\end{aligned}$$

6. Nilai rata-rata regangan keempat spesimen

$$\begin{aligned}\varepsilon_{(\text{rata-rata})} &= \frac{\varepsilon_1 + \varepsilon_2 + \varepsilon_3 + \varepsilon_4}{4} \\ &= \frac{0,180 + 0,126 + 0,172 + 0,096}{4} \\ &= 0,143 \%\end{aligned}$$

7. Nilai rata-rata modulus elastisitas dari keempat spesimen

$$\begin{aligned}E_{(\text{rata-rata})} &= \frac{E_1 + E_2 + E_3 + E_4}{4} \\ &= \frac{80,57 + 101,97 + 95,41 + 125,67}{4} \\ &= 11,88\text{GPa}\end{aligned}$$

Pengujian impak

Perhitungan pengujian impak kopolimer hybrid 1 alam (serat rami) 2 sintetis (fiber) metode *Vacuum Infusion*.

1. Spesimen VI 1

$$\text{Diketahui : } l = 14,55 \text{ mm}$$

$$t = 1,34 \text{ mm}$$

$$m = 1 \text{ kg}$$

$$g = 9,8 \text{ m/s}^2$$

$$h = 0,83 \text{ m}$$

$$\cos \alpha = 155^\circ$$

$$\cos \beta = 141^\circ$$

Ditanya : HI (harga impak)

$$\text{Jawab : } E_{\text{serap}} = m \cdot g \cdot h (\cos \beta - \cos \alpha)$$

$$= 1 \cdot 9,8 \cdot 0,83 (-0,771 - (-0,906))$$

$$= 1,099 \text{ J}$$

$$\text{HI} = E_{\text{serap}} / A$$

$$= 1,099 / 19,497$$

$$= 0,0564 \text{ J/mm}^2$$

2. Spesimen VI 2

$$\text{Diketahui : } l = 13,78 \text{ mm}$$

$$t = 1,09 \text{ mm}$$

$$m = 1 \text{ kg}$$

$$g = 9,8 \text{ m/s}^2$$

$$h = 0,83 \text{ m}$$

$$\cos \alpha = 155^\circ$$

$$\cos \beta = 144^\circ$$

Ditanya : HI (harga impak)

$$\text{Jawab : } E \text{ serap} = m \cdot g \cdot h (\cos \beta - \cos \alpha)$$

$$= 1 \cdot 9,8 \cdot 0,83 \cdot 0,097$$

$$= 0,790 \text{ J}$$

$$\text{HI} = E \text{ serap} / A$$

$$= 0,790 / 15,02$$

$$= 0,052 \text{ J/mm}^2$$

3. Spesimen VI 3

$$\text{Diketahui : } l = 14,69 \text{ mm}$$

$$t = 1,19 \text{ mm}$$

$$m = 1 \text{ kg}$$

$$g = 9,8 \text{ m/s}^2$$

$$h = 0,83 \text{ m}$$

$$\cos \alpha = 155^\circ$$

$$\cos \beta = 142^\circ$$

Ditanya : HI (harga impak)

Jawab : $E_{\text{serap}} = m \cdot g \cdot h (\cos \beta - \cos \alpha)$

$$= 1 \cdot 9,8 \cdot 0,83 \cdot 0,118$$

$$= 0,961 \text{ J}$$

$$HI = E_{\text{serap}} / A$$

$$= 0,961 / 17,48$$

$$= 0,055 \text{ J/mm}^2$$

4. Spesimen VI 4

Diketahui : $l = 15,22 \text{ mm}$

$$t = 1,22 \text{ mm}$$

$$m = 1 \text{ kg}$$

$$g = 9,8 \text{ m/s}^2$$

$$h = 0,83 \text{ m}$$

$$\cos \alpha = 155^\circ$$

$$\cos \beta = 143^\circ$$

Ditanya : HI (harga impak)

Jawab : $E_{\text{serap}} = m \cdot g \cdot h (\cos \beta - \cos \alpha)$

$$= 1 \cdot 9,8 \cdot 0,83 \cdot 0,107$$

$$= 0,871 \text{ J}$$

HI = E_{serap} / A

$$= 0,871 / 18,56$$

$$= 0,046 \text{ J/mm}^2$$

Rata – rata nilai hasil impact = $\frac{0,056+0,052+0,055+0,046}{4}$

$$= 0,052 \text{ J/mm}^2$$