$E_{1w} := 49066 \cdot MPa$

$v_{1w} := 0.25$

$\rho w := 2.49 \cdot \frac{gm}{cm^3}$

$E_o := 4100 \cdot MPa$

$v_o := 0.35$

$\rho o := 1.46 \cdot \frac{gm}{cm^3}$

$g = 9.807 \frac{m}{s^2}$

$gm = 1 \times 10^{-3} kg$

ciężar

$F_w = O_w \cdot \gamma w \qquad F_o = O_o \cdot \gamma o$

udział objętościowy

$V_w = \frac{O_w}{O_k} \qquad V_o = \frac{O_o}{O_k}$

ciężar właściwy

$\gamma w := \rho w \cdot g = 2.442 \times 10^4 \frac{kg}{m^2 \cdot s^2}$

$\gamma o := \rho o \cdot g = 1.432 \times 10^4 \frac{kg}{m^2 \cdot s^2}$

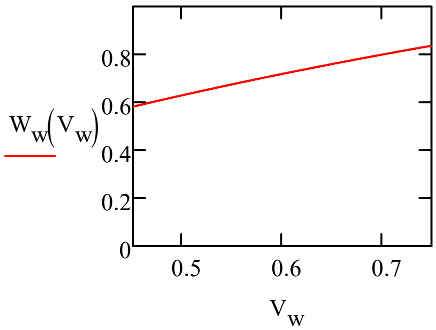
udział wagowy

$$W_w = \frac{F_w}{F_k} = O_w \cdot \frac{\gamma w}{O_w \cdot \gamma w + O_o \cdot \gamma o} = \frac{O_w \cdot \gamma w}{\left(O_w \cdot \gamma w + O_o \cdot \gamma o\right)} \qquad \frac{O_k}{O_k} \qquad W_o = \frac{F_o}{F_k}$$

$$V_w + V_o = 1$$

$$W_w = \frac{V_w \cdot \gamma w}{V_w \cdot \gamma w + V_o \cdot \gamma o} = \frac{V_w \cdot \gamma w}{V_w \cdot \gamma w + \left(1 - V_w\right) \cdot \gamma o}$$

$$W_w\left(V_w\right) := \frac{V_w \cdot \gamma w}{V_w \cdot \gamma w + \left(1 - V_w\right) \cdot \gamma o}$$



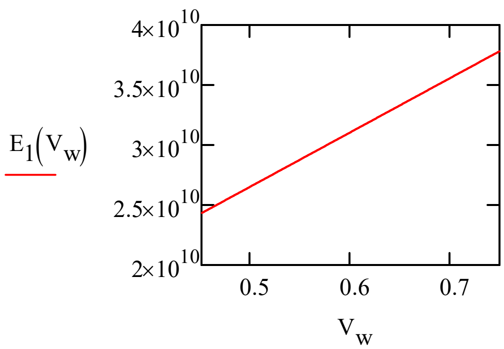
$W_w(0.45) = 0.583$

$W_w(0.75) = 0.837$

$$Q_{ij} = Q_{ij}(E_w, E_o, v_w, v_o, V_w, V_o)$$

$$E_1 = E_{1w} \cdot V_w + E_o \cdot V_o = E_{1w} \cdot V_w + E_o \cdot (1 - V_w)$$

$$E_1(V_w) := E_{1w} \cdot V_w + E_o \cdot (1 - V_w)$$

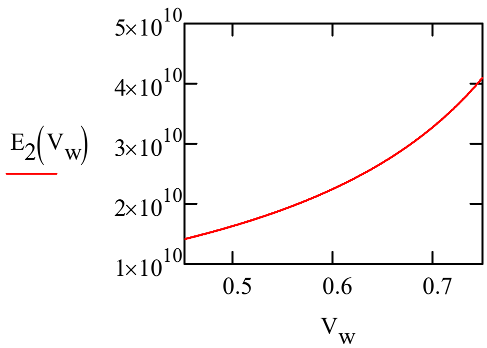


$E_1(0.45) = 2.433 \times 10^{10}\,\text{Pa}$

$E_1(0.75) = 3.782 \times 10^{10}\,\text{Pa}$

$$E_2 = E_o \cdot \frac{(1 + 2 \cdot V_w)}{(1 - V_w)}$$

$$E_2(V_w) := E_o \cdot \frac{(1 + 2 \cdot V_w)}{(1 - V_w)}$$



$E_2(0.45) = 1.416 \times 10^{10}\,\mathrm{Pa}$

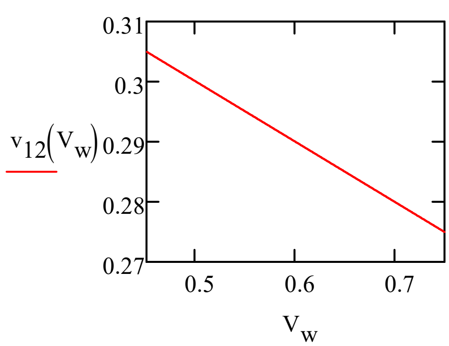
$E_2(0.75) = 4.1 \times 10^{10}\,\mathrm{Pa}$

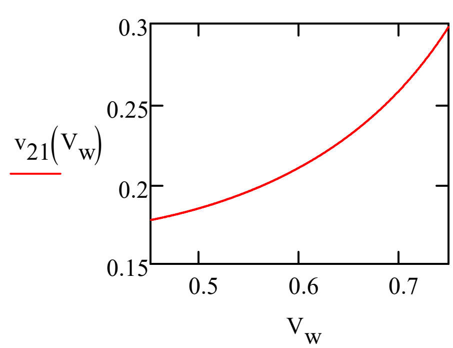
$$v_{12} = v_{1w}\cdot V_w + v_o\cdot V_o$$

$$v_{21} = v_{12}\cdot\frac{E_2}{E_1}$$

$$v_{12}(V_w) := v_{1w}\cdot V_w + v_o\cdot(1 - V_w)$$

$$v_{21}(V_w) := \left[v_{1w}\cdot V_w + v_o\cdot(1 - V_w)\right]\cdot\frac{E_o\cdot\frac{(1 + 2\cdot V_w)}{(1 - V_w)}}{E_{1w}\cdot V_w + E_o\cdot(1 - V_w)}$$





$v_{12}(0.45) = 0.305$

$v_{12}(0.75) = 0.275$

$v_{21}(0.45) = 0.178$

$v_{21}(0.75) = 0.298$

W zależności od wzrostu udziału objętościowego włókna w materiale (Vw) w przedziale 45%-75% moduły Younga E1 i E2 wzrastały, współczynnik Poissona v12 za to malał, a v21 rósł