

$$\rho_{p,w} = \frac{m_p + m_v}{\delta_{AL}(1 - f_{void})}$$

$$\delta_{AL} = \frac{m_p}{\rho_{AL}}$$

$$\rho_{p,w} = \frac{m_p + m_v}{\frac{m_p}{\rho_{AL}}(1 - f_{void})}$$

$$= \frac{\rho_{AL}}{1 - f_{void}} + \left(\frac{\rho_{AL}}{1 - f_{void}} \right) \frac{m_v}{m_p}$$

$$\rho_{p,w} = \frac{\rho_{AL}}{1 - f_{void}} \left(1 + \frac{m_v}{m_p} \right)$$

$m_p \left(\frac{ng}{cm^2} \right)$: Mass of polymer

$m_v \left(\frac{ng}{cm^2} \right)$: mass of water absorbed by polymer only

$\delta_{AL} (cm)$: thickness of (membrane) film

$f_{void} (-)$: void fraction

$\rho_{p,w}$: mass density of wet polymer (not wet film)

