

$$\Delta P = \frac{2 \times 0.021 \text{ N/m}}{5 \times 10^{-9} \text{ m}} = 8.4 \times 10^6 \text{ Pa} = 8.4 \text{ MPa}$$

$$D = \frac{Eh^3}{12(1-\nu^2)}, \quad h = 4 \text{ nm} \Rightarrow D \approx 64 \times D_{\text{mono}}$$

$$V(z) = -\frac{C_3}{z^3}, \quad z = 3.5 \text{ nm}$$

$$V_{\text{total}} = V_{\text{vdw}} + V_{\text{strain}}, \quad \text{slope} = 0.02 \Rightarrow \Delta E \approx 3.2 \text{ meV}$$

$$r_{\min} = 1.122\sigma = 1.122 \times 0.41 \text{ nm} = 0.46 \text{ nm}$$

$$n = \frac{P}{kT} = \frac{8.4 \times 10^6}{1.38 \times 10^{-23} \times 300} \approx 2.0 \times 10^{27} \text{ m}^{-3}$$

$$E_{\text{th}} = kT = 0.026 \text{ eV}$$

$$Z \approx 0.7 - 0.8$$



$$\chi = \frac{24.5}{0.126} \approx 194$$

$$\lambda = \frac{h}{\sqrt{2mE}}, \quad E = 0.65 \text{ eV} \Rightarrow \lambda \approx 1.52 \text{ nm}$$

$$\sigma(0.65 \text{ eV}) = 0.126 \text{ \AA}^2 = 1.26 \times 10^{-21} \text{ m}^2$$

$$L_{\phi} \approx \frac{v_F \hbar}{kT} \approx 10 - 30 \text{ nm}$$

$$\lambda_{\text{mfp}} = \frac{1}{n\sigma} = \frac{1}{2.0 \times 10^{27} \times 1.26 \times 10^{-21}} \approx 0.39 \text{ } \mu\text{m}$$

$$G = \frac{2e^2}{h}MT \approx 77.5 \text{ } \mu\text{S} \text{ } (T \approx 1)$$

$$E_n = V_{vac} - \frac{0.85}{(n + a)^2} \text{ eV}$$

$$V_F \approx 1 \times 10^6 \text{ m/s}$$



$$K = \frac{\sqrt{2m(V-E)}}{\hbar}, \quad V-E = 3.35 \text{ eV} \Rightarrow K \approx 9.37 \text{ nm}^{-1}$$

$$P \approx e^{-2\kappa d}, \quad d = 3.5 \text{ nm} \Rightarrow P \approx 10^{-29}$$

$$J \propto \frac{V^{1.5}}{d^2}$$

$$\rho_{\text{total}} = \rho_{\text{ph}} + \rho_{\text{imp}} + \rho_{\text{interface}} \rightarrow 0$$