Formulas

1 Snell's Law:

$$\Phi_L = \arcsin(\frac{\sin(\Phi_i) \cdot n_{air}}{n_L})$$

$$\Phi_S = \arcsin(\frac{\sin(\Phi_L) \cdot n_L}{n_S})$$

2 Fresnel Equation:

2.1 air/layer:

$$r_{s,al} = \frac{n_{air} \cdot \cos(\phi_i) - n_L \cdot \cos(\phi_L)}{n_{air} \cdot \cos(\phi_i) + n_L \cdot \cos(\phi_L)}$$

$$r_{p,al} = \frac{n_L \cdot \cos(\phi_i) - n_{air} \cdot \cos(\phi_L)}{n_L \cdot \cos(\phi_i) + n_{air} \cdot \cos(\phi_L)}$$

2.2 layer/substrate:

$$r_{s,ls} = \frac{n_L \cdot \cos(\phi_L) - n_S \cdot \cos(\phi_S)}{n_L \cdot \cos(\phi_L) + n_S \cdot \cos(\phi_S)}$$

$$r_{p,ls} = \frac{n_S \cdot \cos(\phi_L) - n_L \cdot \cos(\phi_S)}{n_S \cdot \cos(\phi_L) + n_L \cdot \cos(\phi_S)}$$

3 Fujiwara ellipsometer

$$\beta = \frac{2\pi \cdot d}{\lambda} \cdot N_L \cdot \cos(\phi_L)$$

$$\rho = \frac{r_p}{r_s} = \frac{r_{p,al} + r_{p,ls} \cdot e^{-2i\beta}}{1 + r_{p,al} \cdot r_{p,ls} \cdot e^{-2i\beta}} \cdot \frac{1 + r_{s,al} \cdot r_{s,ls} \cdot e^{-2i\beta}}{r_{s,al} + r_{s,ls} \cdot e^{-2i\beta}}$$

(Kehrwert zweiter Bruch = r_s)

$$\rho = \tan(\Psi) \cdot e^{i\Delta}$$