N5STRASYMa

Symbolic calculation of the reflected intensity for N double layers.

$$\begin{pmatrix} 0 & \frac{-i}{nH} \\ -i \cdot nH & 0 \end{pmatrix} \cdot \begin{pmatrix} 0 & \frac{-i}{nL} \\ -i \cdot nL & 0 \end{pmatrix}$$

$$\begin{pmatrix} \frac{i^2}{nH} \cdot nL & 0 \\ 0 & i^2 \cdot \frac{nH}{nL} \end{pmatrix}$$ This may be written as

$$\begin{pmatrix} \frac{-nL}{nH} & 0 \\ 0 & \frac{-nH}{nL} \end{pmatrix}$$

For (MH*ML)^N one has

$$\begin{pmatrix} \frac{-nL}{nH} & 0 \\ 0 & \frac{-nH}{nL} \end{pmatrix}^N \quad \text{equal} \quad \begin{bmatrix} \left(\frac{-nL}{nH}\right)^N & 0 \\ 0 & \left(\frac{-nH}{nL}\right)^N \end{bmatrix}$$

We have to solve

$$\begin{pmatrix} Af \\ -Af \end{pmatrix} = \begin{bmatrix} \left(\frac{-nL}{nH}\right)^N & 0 \\ 0 & \left(\frac{-nH}{nL}\right)^N \end{bmatrix} \cdot \begin{pmatrix} A1 + A2 \\ -A1 + A2 \end{pmatrix} \qquad \begin{pmatrix} A1 + A2 \\ -A1 + A2 \end{pmatrix}$$

$$\begin{pmatrix} Af \\ -Af \end{pmatrix} = \begin{bmatrix} \left(\frac{-nL}{nH}\right)^N \cdot (A1 + A2) \\ \left(\frac{-nH}{nL}\right)^N \cdot (-A1 + A2) \end{bmatrix}$$

For solving the system of linear equations

x is Af/A1 y is A2/A1

a is $\left(\frac{-nL}{nH}\right)^N$ b is $\left(\frac{-nH}{nL}\right)^N$

Given

$$x = a \cdot (1 + y)$$

$$-x = b \cdot (-1 + y)$$

Find(x, y)

$$\begin{bmatrix} 2 \cdot a \cdot \frac{b}{(a + b)} \\ \frac{(-a + b)}{(a + b)} \end{bmatrix}$$

We have for y the reflected amplitude divided by the incident amplitude

$$y = \frac{(-a + b)}{(a + b)}$$

For the intensity

$$R = \left[\frac{(-a + b)}{(a + b)}\right]^2$$