The strain tensor components of this background strain are

$$\left.\begin{aligned}E_{xx}&=u_0\cos^2\phi,\\E_{yy}&=u_0\sin^2\phi,\\E_{xy}&=\tfrac{1}{2}u_0\sin 2\phi,\end{aligned}\right\}\tag{1}$$

whilst the strain tensor corresponding to anomalous interlayer spacing in the lamella is simply

$$e_{xx}=u. \tag{2}$$

Following Fathers and Tanner (1973 a, b) and Tanner and Fathers (1974) we have, for the secular equation giving the refractive indices, n,

$$\begin{vmatrix}\dfrac{1}{n^2}-[\gamma_0+b_1(e_{xx}+E_{xx})+b_2\Delta] & -b_1E_{xy}\\ -b_1E_{xy} & \dfrac{1}{n^2}-[\gamma_0+b_1E_{yy}+b_2\Delta]\end{vmatrix}=0, \tag{3}$$

where $\Delta=e_{xx}+E_{xx}+E_{yy}$, γ_0 is the inverse dielectric constant of the isotropic matrix, and b_1 and b_2 are the strain optic coefficients defined by eqn. (3) of Fathers and Tanner (1973 b). It follows that the normal modes are plane-polarized at an angle θ to the x axis where

$$\theta=\tfrac{1}{2}\tan^{-1}\left\{\frac{-2E_{xy}}{e_{xx}+E_{xx}-E_{yy}}\right\}. \tag{4}$$

The difference in refractive indices Δn of the two modes is

$$\Delta n=\tfrac{1}{2}n^3b_1\{(e_{xx}+E_{xx}-E_{yy})^2+4E_{xy}^2\}^{1/2}, \tag{5}$$

where n is the average refractive index. As the normal modes are independent of distance z along the propagation direction Oz, the phase shift between modes propagating through crystal thickness t is

$$\delta=\frac{\pi t}{\lambda}\Delta n, \tag{6}$$

and the normalized intensity transmitted through a crossed polarizer and analyser is

$$\begin{aligned}I&=\sin^2\delta\sin^2 2(\alpha+\theta)\\&\cong\delta^2\sin^2 2(\alpha+\theta),\end{aligned}\tag{7}$$

where α is the angle the polarizer makes with the y axis and is the same in magnitude and sense as the specimen rotation angle α defined in §2. Thus we have

$$I=C[(u+u_0\cos 2\phi)\sin 2\alpha+u_0\sin 2\phi\cos 2\alpha]^2, \tag{8}$$

where $C=\pi^2t^2b_1^2n^6/4\lambda^2$. Remote from the fault, I reduces to the background intensity, I_0, given by

$$I_0=Cu_0^2\sin^2 2(\alpha+\phi). \tag{9}$$

Experimentally, a minimum of I_0 was found at $\alpha=34°$ (fig. 3 (*a*)). Choosing ϕ in the range $0<\phi<\pi/2$ gives $\phi=56°$. The differences ΔI, between the intensity I at the fault