$$a) e^{nπi}=(-1)^{n}$$

$$b) e^{nπi}=e^{-nπi}$$

$$c) e^{πi}=e^{3πi}=e^{5πi}=-1$$

$$d) e^{2πi}=e^{4πi}=e^{6πi}=+1$$

$$F\_{hkl}=\sum\_{1}^{N}f\_{n}e^{2πi(hu\_{n}+kv\_{n}+lw\_{n})}$$

$$F\_{hkl}=f\_{1}e^{2πi(h0\_{1}+k0\_{1}+l0\_{1})}$$

$$F\_{hkl}=f\_{1}e^{2πi(0)}=f\_{1}e^{0}=f\_{1}$$

$$F\_{hkl}^{2}=f\_{1}^{2}$$

$$F\_{hkl}=\sum\_{1}^{N}f\_{n}e^{2πi(hu\_{n}+kv\_{n}+lw\_{n})}$$

$$F\_{hkl}=f\_{1}e^{2πi(h0\_{1}+k0\_{1}+l0\_{1})}+f\_{2}e^{2πi(h0,5\_{2}+k0,5\_{2}+l0\_{2})}$$

$$F\_{hkl}=f\_{1}e^{2πi\left(0\right)}+f\_{2}e^{2πi\left(h0,5\_{2}+k0,5\_{2}\right)}$$

$$F\_{hkl}=f\_{1}(1+e^{πi\left(h+k\right)})$$

$$F\_{hkl}=f\_{1}(1+e^{πi\left(h+k\right)})$$

$$e^{πi\left(h+k\right)}=e^{πi\left(1+1\right)}=e^{πi\left(2\right)}=1$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+2\right)}=e^{πi\left(4\right)}=1$$

$$F\_{hkl=unmixed}=f\left(1+1\right)=2f$$

$$F\_{hkl}=2f$$

$$\left(F\_{hkl}\right)^{2}=4f^{2}$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+1\right)}=e^{πi\left(3\right)}=-1$$

$$F\_{hkl(ímpar)}=f\left(1-1\right)=2f.0$$

$$F\_{hkl=mixed}=0$$

$$\left(F\_{hkl}\right)^{2}=0$$

$$F\_{hkl}=\sum\_{1}^{N}f\_{n}e^{2πi(hu\_{n}+kv\_{n}+lw\_{n})}$$

$$F\_{hkl}=f\_{1}e^{2πi(h0\_{1}+k0\_{1}+l0\_{1})}+f\_{2}e^{2πi(h0,5\_{2}+k0,5\_{2}+l0,5\_{2})}$$

$$F\_{hkl}=f\_{1}e^{2πi\left(0\right)}+f\_{2}e^{2πi\left(h0,5\_{2}+k0,5\_{2}k+0,5\_{2}\right)}$$

$$F\_{hkl}=f(1+e^{πi\left(h+k+l\right)})$$

$$F\_{hkl}=f(1+e^{πi\left(h+k\right)})$$

$$e^{πi\left(h+k+l\right)}=e^{πi\left(1+1+1\right)}=e^{πi\left(3\right)}=-1$$

$$e^{πi\left(h+k+l\right)}=e^{πi\left(2+2+2\right)}=e^{πi\left(6\right)}=+1$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+2\right)}=e^{πi\left(4\right)}=1$$

$$F\_{hkl (par)}=f\left(1+1\right)=2f$$

$$F\_{hkl}=2f$$

$$\left(F\_{hkl}\right)^{2}=16f^{2}$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+1\right)}=e^{πi\left(3\right)}=-1$$

$$F\_{hkl=mixed}=f\left(1-1\right)=2f.0$$

$$F\_{hkl=mixed}=0$$

$$\left(F\_{hkl=mixed}\right)^{2}=0$$

$$F\_{hkl}=\sum\_{1}^{N}f\_{n}e^{2πi(hu\_{n}+kv\_{n}+lw\_{n})}$$

$$F\_{hkl}=f\_{1}e^{2πi(h0\_{1}+k0\_{1}+l0\_{1})}+f\_{2}e^{2πi(h0,5\_{2}+k0,5\_{2}+l0\_{2})}+f\_{3}e^{2πi(h0,5\_{3}+k0\_{3}+l0,5\_{3})}+f\_{4}e^{2πi(h0\_{4}+k0,5\_{4}+l0,5\_{4})}$$

$$F\_{hkl}=f\_{1}e^{2πi(0)}+f\_{2}e^{πi(h+k)}+f\_{3}e^{πi(h+l)}+f\_{4}e^{πi(k+l)}$$

$$F\_{hkl}=f(1+e^{πi\left(h+k\right)}+e^{πi\left(h+l\right)}+e^{πi\left(k+k\right)})$$

$$e^{πi\left(h+k+l\right)}=e^{πi\left(1+1+1\right)}=e^{πi\left(3\right)}=-1$$

$$e^{πi\left(h+k+l\right)}=e^{πi\left(2+2+2\right)}=e^{πi\left(6\right)}=+1$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+2\right)}=e^{πi\left(4\right)}=1$$

$$F\_{hkl (mixed)}=f\left(0\right)=0$$

$$F\_{hkl}=2f$$

$$\left(F\_{hkl}\right)^{2}=0$$

$$e^{πi\left(h+k\right)}=e^{πi\left(2+1\right)}=e^{πi\left(3\right)}=-1$$

$$F\_{hkl=mixed}=f\left(1-1\right)=2f.0$$

$$F\_{hkl=mixed}=0$$

$$\left(F\_{hkl=mixed}\right)^{2}=0$$







$$f(\frac{sen(θ)}{λ})$$

$$n.λ=2.d.sen(θ)$$

$$Para cristais cúbicos:$$

$$\frac{1}{d^{2}}=\frac{\left(h^{2}+k^{2}+l^{2}\right)}{a^{2}}$$

$$d^{2}=\frac{a^{2}}{\left(h^{2}+k^{2}+l^{2}\right)}$$

$$λ^{2}=2^{2}.d^{2}.sen(θ)^{2}$$

$$sen(θ)^{2}=\frac{λ^{2}}{2^{2}.d^{2}}$$

$$sen(θ)^{2}=\frac{λ^{2}.\left(h^{2}+k^{2}+l^{2}\right)}{4.a^{2}}$$

$$sen(θ)^{2}=\frac{\left(1,542\right)^{2}.\left(\left(1\right)^{2}+\left(1\right)^{2}+\left(1\right)^{2}\right)}{4.\left(3,615\right)^{2}}$$

$$sen(θ)^{2}=\frac{2,377.\left(3\right)}{4.13,068}$$

$$sen(θ)^{2}=0,1364$$

$$sen(θ)=0,3694$$

$$θ=21,679°$$

$$f(\frac{sen(θ)}{λ})$$

$$f\left(\frac{0,3694}{1,542}\right)=f\left(0,23955\right)=20,136$$

$$\left(F\_{hkl}\right)^{2}=16f^{2}$$

$$\left(F\_{111}\right)^{2}=16\left(20,136\right)^{2}$$

$$\left(F\_{111}\right)^{2}=6487,33$$





$$p=8$$

$$Fator de polarização-Lorentz=\left(\frac{1+cos⁡(2θ)^{2}}{sen⁡(θ)^{2}.cos⁡(θ)}\right)$$

$$\left(\frac{1+cos⁡(2.21,679)^{2}}{sen⁡(21,679)^{2}.cos⁡(21,679)}\right)=12,05$$



$$I=\left|F\right|^{2}.p.\left(\frac{1+cos⁡(2θ)^{2}}{sen⁡(θ)^{2}.cos⁡(θ)}\right)$$

$$I=6487,33.8.12,05$$

$$I\_{111}=625614,23 u.a.$$

$$I\_{111}=625614,23 u.a.=15752,00 u.a.$$

$$I\_{200}=292178 u.a.=7189,00 u.a.$$

$$I\_{220}=171907 u.a.=2994,00 u.a.$$

$$I\_{311}=205004 u.a.=3545,00 u.a.$$

$$I\_{111}=100\%=100\%$$

$$I\_{200}=46,7\%=45,63\% $$

$$I\_{220}=27,5\%=19,00\%$$

$$I\_{311}=32,8\%=22,50\% $$