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PROGRAM etotr
*****
* Conversion of dielectric function to thin film transmission and *
* reflection. The file etot.in should contain on a single line : *
*   inputfilename (x y format) *
*   teta wsamp wsub nsub *
* teta in degree, sample thickness in cm, substrate thickness in cm, *
* real part of substrate optical constant. *
* the standard input file must have the format x eps1 eps2 *
* The output comes as: x t^2 r^2 *
*****
parameter (nn=5000)
REAL X(nn),e1,e2,nsub,wsamp,wsub,teta,rr(nn),tr(nn)
complex epsil(nn),eps0,epssub
character*40 flin
INTEGER I,mm
mm=nn
read(*,'(a40)') flin
open(4,file=flin)
read(*,*) teta,wsamp,wsub,nsub
epssub=nsub**2
eps0=1.
teta=teta*4.*atan(1.)/180.
do 10 i=1,mm
  READ(4,*,END=11) X(i),e1,e2
  epsil(i)=cplx(e1,e2)
10 continue
11 mm=i-1
CALL FRESNL(mm,WSAMP,WSUBS,TETA,RR,TR,x,EPS0,EPSIL,EPSSUB)
do 25 i=1,mm
  write(*,*) x(i),tr(i),rr(i)
25 continue
close(4)
END

*****
SUBROUTINE FRESNL(NUM,WW1,WW2,TETA,RR,TR,NY,EPS0,EPS1,EPS2)
parameter (nn=5000)
REAL KLAD,KW1,KW2,pi
REAL RR(nn),TR(nn),NY(nn),TETA,WW1,WW2
COMPLEX EPS0,EPS1(nn),EPS2
INTEGER I,NUM
COMPLEX Q0,Q1,Q2,W1,A,B,SNT,R,T,TW1,CW1,SW1
pi=4.*atan(1.)
c write(*,*) num,ww1,ww2,teta,eps0,eps2
DO 100 I=1,NUM
c write(*,*) ny(i),eps1(i)
KW1=2*PI*WW1*NY(I)
KW2=2*PI*WW2*NY(I)
Q0=CMPLX(COS(TETA))
SNT=(1.,0.)-Q0**2
Q1=CSQRT(EPS1(I)/EPS0-SNT)
Q2=CSQRT(EPS2/EPS0-SNT)
W1=Q1*CMPLX(KW1)
c write(*,*) 'kw1,kw2,w1 ',kw1,kw2,w1
CW1=CCOS(W1)
SW1=CSIN(W1)
TW1=SW1/CW1

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c      write(*,*) 'q0,q1,q2,cw1,sw1,tw1 ',q0,q1,q2,icw1,sw1,tw1
A=Q1*(Q0-Q2)-(Q0*Q2-Q1**2)*(0.,1.)*TW1
B=Q1*(Q0+Q2)-(Q0*Q2+Q1**2)*(0.,1.)*TW1
R=A/B
T=Q0*((1.,0.)-R)/(Q2*CW1-(0.,1.)*Q1*SW1)
c      write(*,*) 'a,b,r,t ',a,b,r,t
RR(I)=(REAL(R))**2+(AIMAG(R))**2
TR(I)=(REAL(T))**2+(AIMAG(T))**2
A=2*Q2/(Q0+Q2)
TR(I)=TR(I)*(REAL(A)**2+AIMAG(A)**2)
KLAD=KW2*2*AIMAG(Q2)*(-1)
IF (KLAD.GT.-20) THEN
  TR(I)=TR(I)*EXP( KLAD)
ELSE
  TR(I)=0.
ENDIF
IF (ABS(TR(I)) .LT. 1.E-12) TR(I)=0.
IF (ABS(RR(I)) .LT. 1.E-12) RR(I)=0.
c      write(*,*) tr(i),rr(i)
100  CONTINUE
      RETURN
      END
*****

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