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# Optical - thermal properties of synthetic anorthite/silica glass: Phonon thermal conductivity and specific refraction of light

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An interesting relationship between the Phonon Thermal Conductivity, k,
and seismic parameter F for silicates and oxides related to the Earth's
mantle is recalled. The theoretical investigation was based on the Debye's model of lattice vibrations and the Anderson-Jordan seismic
equation of state. Thermodynamical laboratory data of main minerals in
the form of polycrystalline aggregates were also used. At room temperature (To) relationship of the form log k = (5/6)log F - 0.7422
is valid. A correlation between the optical specific refraction Rsp =
(n-1)/d and pressure p from 0 to 6 GPa for synthetic anorthite/silica
glass is considered. This synthetic glass with the density d = 2.60 g/cc at ambient pressure had the composition: CaO/Al2O3/4[SiO2] and
contained about 67% of silicon dioxide. Eksperimental data on the
refractive indices and hydrostatic pressures and also on the density
at p = 0 were taken from R.G Kuryaeva and N.V. Surkov (2008). Let us
assume that the specific refraction value Rsp(p=0)= [n(0)-1]/d(0) =
0.2035 cc/g is about constant in the whole 0-6 GPa range. In this case,
the derivative dRsp/dp = 0 and we have a very simple equation: dn/dp =
Rsp/F. Since the mean value of pressure gradient dn/dp is about 0.0167 [1/GPa] at the pressure from 0 to 1.25 GPa, we can write that F(p=0) =
12.19 (km/s)$\hat{2}$ for synthetic anorthite/silica glass. Thus we obtain the characteristic value of k(0)= 1.46 W/m K. It is in good agreement
with the PTC of natural silica glass (lechatelierite) or similar synthetic phases as, e.g., porosiles.