EFFECTS OF P AND T ON PHYSICAL PARAMETERS

The effects of P are fairly well known from two somewhat interconnected sources: 1) experiments on pure substances (crystals and pure monomineralic aggregates) by isothermal compression, dynamic compression, ultrasonics, and X-rays, 2) experiments on rocks and natural monomineralic aggregates. Theoretical studies could also be important, but so far they have been concerned with extrapolation of the experimental results rather than to fundamental research.

Figure 5 summarize results on $\Delta V/V_0$ for some oxides and silicates up to 10 or 20 - 25 kbar [5, 12 - 14]. The results for certain substances (diopside, garnets, etc.) are somewhat conflicting, but the order of decreasing compressibility is generally as follows: quartz, (micas), feldspars (from orthoclase to anorthite), (amphiboles), pyroxenes (from augite to jadeite and spodumene), olivine, zircon, garnets (from andradite to pyrope), periclase, hematite, magnetite, ilmenite, chromite, cassiterite, spinel, rutile, corundum, bromellite, (stishovite). This series in general reflects the decrease in molecular volume and only indirectly (for silicates) is related to the density. The $\Delta V/V_0 = f(P)$ curves differ in slope. The compressibility β is deduced from the linear parts as

$$\beta p = \frac{\Delta v}{v_0}, \qquad (5)$$

which gives $K = 1/\beta$ as linearly varying with P; $K' = dK/dP$ varies with the mineral, being largest for quartz (about 6.0) and least for bromellite or stishovite. Exact values for K'

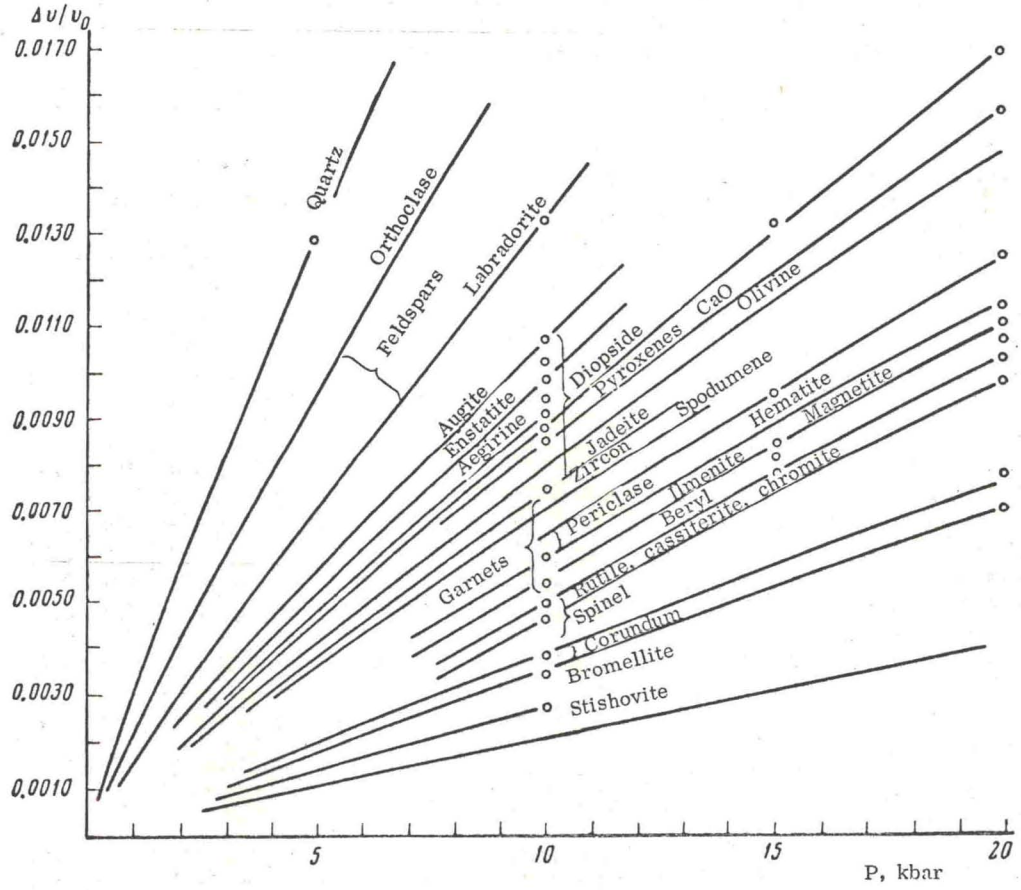

Fig. 5. $\Delta V/V_0$ as a function of P for oxides and silicates.