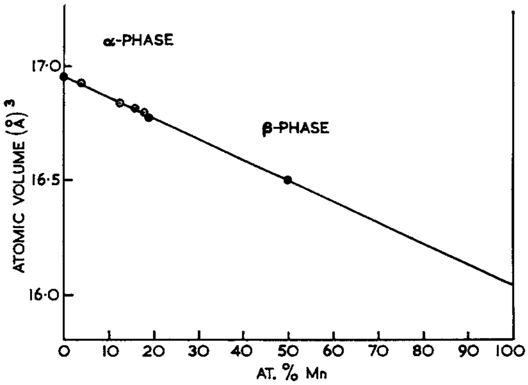

Figure 1

which this martensitic transformation takes place can be varied systematically, by replacing some of the Mn atoms with slightly larger atoms, such as those of Al, thus varying the volume size-factor.

Work is at present in progress to investigate the way in which this control of crystal structure can be used to produce desired magnetic properties in these ternary alloys.

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*Piezo-optic Behaviour of Rubidium Chloride up to the Phase Transition Point**

Single crystals of RbCl were grown by the Bridgman method from chemically pure† (99.9%) materials obtained from A. D. Mackay & Co‡, and were cleaved, ground and polished to about 8 × 6 × 3 mm size, such that localised interference fringes of the Newtonian type were visible. The samples were then coated with a thin layer of aluminium by evaporation, to increase the contrast of the fringes. With the use of an optical high pressure bomb and the experimental arrangement described elsewhere [1, 2], the variation of the refractive index of RbCl with pressure was determined from the shift of the interference fringes. For the computation of the thickness change the second-order elastic constants data of Haussuhl [3] were used in conjunction with the third-order elastic constants theoretically evaluated by Ghate [4]. It is believed that the use of Ghate's theoretical values is justifiable, in view of the good agreement of his similar theoretical values for NaCl and KCl with the experimentally determined values of Chang [5], and also from the consistency of our own results.

Fig. 1 represents the variation of the refractive index Δn as a function of hydrostatic pressure. Considering that the error involved in the measurement of Δn is only 2 to 3 in the third figure, it is seen that above 3 kbars a distinct departure from linearity is noticed. However, the plot of Δn as a function of the volume strain $\Delta V/V_0$, computed from the Lagrangian strain η from $\Delta V/V_0 = 3\eta\,(1 + \frac{1}{2}\eta)$, gives a linear relation in the entire range in-

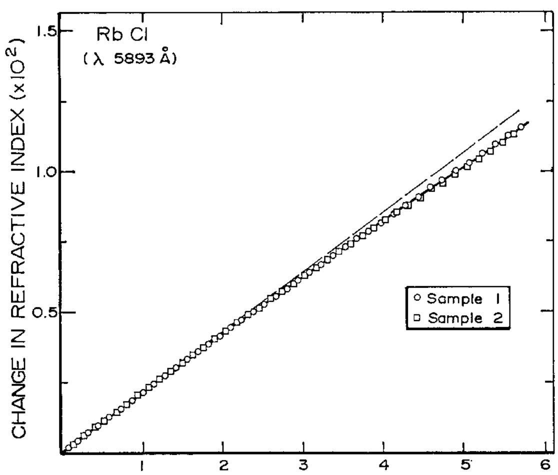

Figure 1 Variation of refractive index of RbCl with pressure; $T = 22°$ C.

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† Impurities detected by spectrochemical analysis: K, 0.05 to 0.1%; Cs, 0.05 to 0.1%; Na, 5 to 20 ppm; Fe, 10 to 50 ppm; Ca, 2 to 10 ppm; Li < 100 ppm.

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vestigated, even though the volume strain involved is as high as 3.2%, as shown in fig. 2. Thus, it appears that the strain is a more fundamental parameter both from the theoretical point of view as well as from the extensive range over which a simple linear law is applicable. Of course, it must be mentioned that there is no *a priori* reason to expect such a linear relation to be valid universally, and at all ranges.

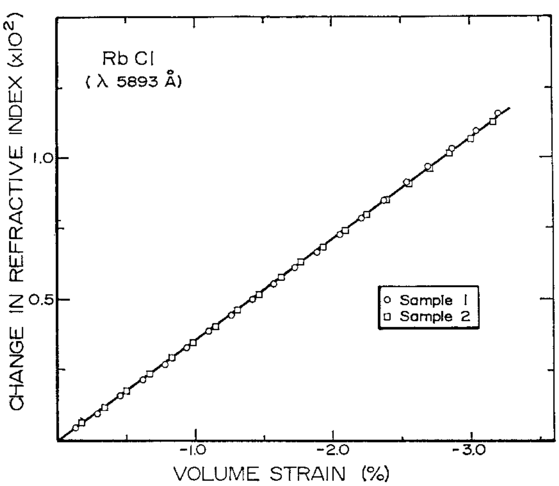

Figure 2 Variation of refractive index of RbCl with volume strain; $T = 22°$ C.

The measurements had to be terminated at 5.7 kbars, at which pressure the fringes were found to disappear owing to the onset of the phase transformation to the CsCl lattice structure. On releasing the pressure, the fringes did not reappear again owing to the permanent distortion of the evaporated aluminium layer on the surfaces, even though the crystal itself was found to be clear. It is believed that the permanent distortion of the aluminium mirror surfaces arises from the simultaneous incoherent nucleation of the second phase at a number of centres on the surface of the crystal giving rise to many mismatched grains, and also from the large volume change accompanying the phase transition.

An examination of the literature reveals that the high pressure phase transformation in RbCl has been reported at various pressures in the range 5.7 to 7.5 kbars [6-10]. Possible causes for this large variation have been discussed by Fitchen [9], who came to the conclusion that the lower values were caused by the "slight shearing stresses due to the viscosity of the liquid pressure medium helping to initiate the local shear involved in the transformation". This seems unlikely for the following reasons. The present authors, using "Sovasol"* as the fluid pressure medium, find the onset of the phase transition at 5.7 kbars, and their value must therefore be equal to or greater than the equilibrium transition pressure. At this pressure the viscosity of Sovasol increases to only about 30 times the value at atmospheric pressure (i.e. to a value of $\sim$ 0.005 poise), and thus it is still very fluid (the viscosity of light machine oil is about 0.05 poise). Thus, it is rather hard to believe that this fluid can generate shearing stresses to initiate nucleation at these low pressures. On the other hand, the authors feel that the low transition pressure observed is caused by frozen-in stresses near the surfaces produced during the optical polishing and other such fabrication procedures. Furthermore, the kinetics of this rather sluggish transition is an extremely important aspect of the problem, and would have to be considered if firm conclusions on the equilibrium were derived.

From the Δn versus strain plot, the value of $\rho(dn/d\rho) = -dn/(dv/V_0)$ can be obtained, and this was found to have a value 0.356 ± 2. The significance of this result will be discussed elsewhere, along with similar results on other cubic crystals.

* "Sovasol" is marketed by the Socony Mobile Oil Co.

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Recent Soviet Work on the Dielectric Properties and Sintering of Alumina

Readers of the review by Perry [*J. Matls. Sci.* **1** (1966) 186] recently published in this Journal may be interested in the following short bibliography of papers on alumina recently published by members of the Ukrainian Institute for the Scientific Study of Refractories.

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