Table 1

Temperature (° C.)	$-(q_{11}-q_{12})$ (units of 10^{-13} c.g.s.)	$-(p_{11}-p_{12})$	p_{12}/p_{11}	p_{11}	p_{12}	$-q_{44}$ (units of 10^{-13} c.g.s.)	$-p_{44}$
32	1.12	0.041	1.31	0.132	0.172	0.94	0.0120
100	0.99	0.033	1.26	0.128	0.161	0.90	0.0113
150	0.91	0.029	1.23	0.125	0.154	0.87	0.0108
200	0.84	0.025	1.19	0.132	0.157	0.84	0.0103
250	0.78	0.022	1.15	0.145	0.167	0.80	0.0096
300	0.74	0.020	—	—	—	0.76	0.0090

A modified form of Filon's method², with a suitable heating arrangement, has been used to measure the stress-optical constants ($q_{11}-q_{12}$) and q_{44} at different temperatures. From these results, using the appropriate elastic constants, the strain-optical constants ($p_{11}-p_{12}$) and p_{44} are evaluated. To determine the absolute strain-optical constants p_{11} and p_{12} , the ratio p_{12}/p_{11} is measured at different temperatures by a modification of the ultrasonic method³. Combining the values of p_{12}/p_{11} and ($p_{11}-p_{12}$), the absolute strain-optical constants p_{11} and p_{12} have been evaluated. Table 1 shows the results obtained for sodium chloride. It was possible to measure p_{12}/p_{11} up to only 250° C., as the Hiedemann pattern became very diffuse above this temperature. The variation with temperature of p_{11} , p_{12} and p_{44} is shown graphically in Fig. 1. The elastic constants at different temperatures needed for these calculations are taken from a paper by Hunter and Siegel⁴ and the thermo-optical data have been provided by M. A. H. Shareef (private communication). Work with other crystals is in progress and will be published in due course.

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Intensity Aspects as Determinant of $r'_e-r''_e$ in the Bands of the Lanthanum Oxide (LaO)(B→X) System

An attempt made by Meggers and Wheeler¹ to investigate the rotational analysis of the yellow system of lanthanum oxide did not prove successful, because of the low resolving power of the concave grating used by them. This band system has not yet been subjected to a successful structure analysis, though some attempts are under way². Tawde and Chandratreya³ have estimated the difference (Δr_e) in the internuclear separations in the levels B and X of this system to be 0.057 Å., mainly from the study of vibrational transition probabilities in relation to asymmetry of the molecules. A later investigation⁴ on the vanadium oxide (VO) (green-yellow) system has revealed the validity of revised rotational constants⁵. This was based purely on consideration of the results of the comparative study of the experimental and theoretical transition probabilities, and not on the study of the asymmetry effect on the transition probabilities made by them for the purpose. It occurred to me to establish the Δr_e -value of the

yellow system of lanthanum oxide from considerations similar to those in vanadium oxide, so as to enable those engaged in the rotational analysis of this band system to use the value as a check on their determinations.

Chandratreya⁶ has derived the experimental transition probabilities of this band system. They are shown in Table 1. His value of the experimental transition probability of the (0,0) band, which is the intense band of the system, is 0.79. Using this value and the mathematical technique of Manneback⁷, Δr_e is calculated for the (0,0) band. It is found to be 0.0378 Å. This value was checked from two other bands (0,1) and (1,0) and is about ± 0.004 Å. on either side. With this value of Δr_e , the Franck-Condon factors of the other bands have been computed and are shown in Table 1. Hutchisson's method⁸ has been used to check these values⁹.

Table 1

Band v', v''	Experimental	Theoretical $\Delta r_e = 0.0378_2$ Å.	Band v', v''	Experimental	Theoretical $\Delta r_e = 0.0378_2$ Å.
0,0	0.79	0.79	2,0	0.05	0.02
0,1	0.21	0.18	2,1	0.14	0.32
0,2	0.05	0.03	2,2	0.31	0.24
			2,3	0.40	0.28
1,0	0.16	0.19	2,4	0.08	0.11
1,1	0.57	0.46	3,1	0.07	0.04
1,2	0.31	0.26	3,2	0.26	0.39
1,3	0.05	0.07	3,3	0.27	0.11
			3,4	0.49	0.25

The molecular constants needed for this computation are taken from Herzberg's treatise¹⁰. As lanthanum oxide is a molecule of considerable astrophysical importance¹¹, these two sets of transition probabilities will be useful to the astrophysicists. It is found from Table 1 that there is a good agreement of the experimental transition probabilities with the theoretical set calculated with $\Delta r_e = 0.0378_2$ Å., though simple harmonic oscillator wave-functions are used in the theoretical calculations. A similar investigation by Tawde and me on the vanadium oxide (green-yellow) system referred to above lends support to such a method of assigning $\Delta r_e \sim 0.038$ Å. in the case of B- and X-levels of lanthanum oxide.

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