bands of the $\Delta v = 0$ sequence of the HfBr systems are double headed consisting of R and Q heads of a component of a doublet-doublet transition in which $\Delta A = \pm 1$. There is also a weak group of bands at $\lambda 6997 \cdot 7 \text{Å}$ which may be probably the $\Delta v = 0$ sequence of the other component of the doublet-doublet transition. The measurements and classification of the bands are given in Table I.

TABLE I

List of vacuum wavenumbers and intensities of band heads in the red system of HfI

Wavenumber cm^{-1}	Intensity† I	Classification v', v''
14717·2		1,0*
14559·7	9	0,0
52·5	9	1,1
45·4	9	2,2
8·4	9	3,3
31·1	8	4,4
23·3	7	5,5
15·4	6	6,6
07·3	3	7,7
14498·8	2	8,8
14394·8		0,1*
14286·5		0,0*

* From the measurements of Glass Littrow Spectrogram.

† The intensities quoted heie are on visual estimates.

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THERMAL EXPANSION OF COBALT FERRITE AND COBALT-ZINC FERRITE

A PERUSAL of the literature shows that there are no data on the accurate cell parameters and the coefficients of thermal expansion for the Co-Zn ferrites except for the report by Weil[1] who determined the thermal expansion of cobalt ferrite by the dilatometric method. The present note gives the cell parameters and the coefficients of thermal expansion at different temperatures for cobalt ferrite ($CoFe_2O_4$) and a cobalt-zinc ferrite ($Co_{0.2} Zn_{0.8} Fe_2O_4$).

In each case, the specimen for the study was prepared by pasting the powder to a thin pyrex rod with araldite. Using a Unicam 19 cm high temperature powder camera and FeK radiation from a Raymax-60 demountable X-ray unit, powder photographs were taken at different temperatures in the range 27° to 665° C. Reflections from (642), (731), (800), (822) and (751) planes, recorded in the Bragg angle range 59° to 85°, were used to evaluate the accurate cell parameters at different temperatures by the Cohen's[2] analytical method. Using these data, the coefficients of thermal expansion at different temperatures were evaluated by a graphical method. The experimental details and the method of evaluating the cell parameters and the coefficients of thermal expansion are given in an earlier paper[3].

The lattice parameters of cobalt ferrite and $Co_{0.2} Zn_{0.8} Fe_2O_4$ obtained at different temperatures are shown in Table I.

TABLE I
Lattice parameters of $CoFe_2O_4$ and $Co_{0.2}Zn_{0.8}Fe_2O_4$

Temperature (°C)	Cell Parameter (Å)	
	$CoFe_2O_4$	$Co_{0.2} Zn_{0.8} Fe_2O_4$
27	..	8·4261
32	8·3869	..
114	..	8·4327
215	8·4015	8·4384
299	8·4087	..
407	8·4203	8·4538
482	8·4252	8·4600
497	8·4305	8·4628
516	8·4318	8·4638
534	8·4364	..
584	8·4429	8·4691
665	8·4521	..

The temperature dependence of the coefficient of thermal expansion 'α' for the two ferrites is represented by the following equations.

For $CoFe_2O_4$

$\alpha_T = 7 \cdot 326 \times 10^{-6} + 1 \cdot 516 \times 10^{-8} T + 0 \cdot 800 \times 10^{-12} T^2$

For $Co_{0.2} Zn_{0.8} Fe_2O_4$

$\alpha_T = 7 \cdot 512 \times 10^{-6} + 1 \cdot 620 \times 10^{-9} T + 9 \cdot 340 \times 10^{-12} T^2$

where T is the temperature in ° C.

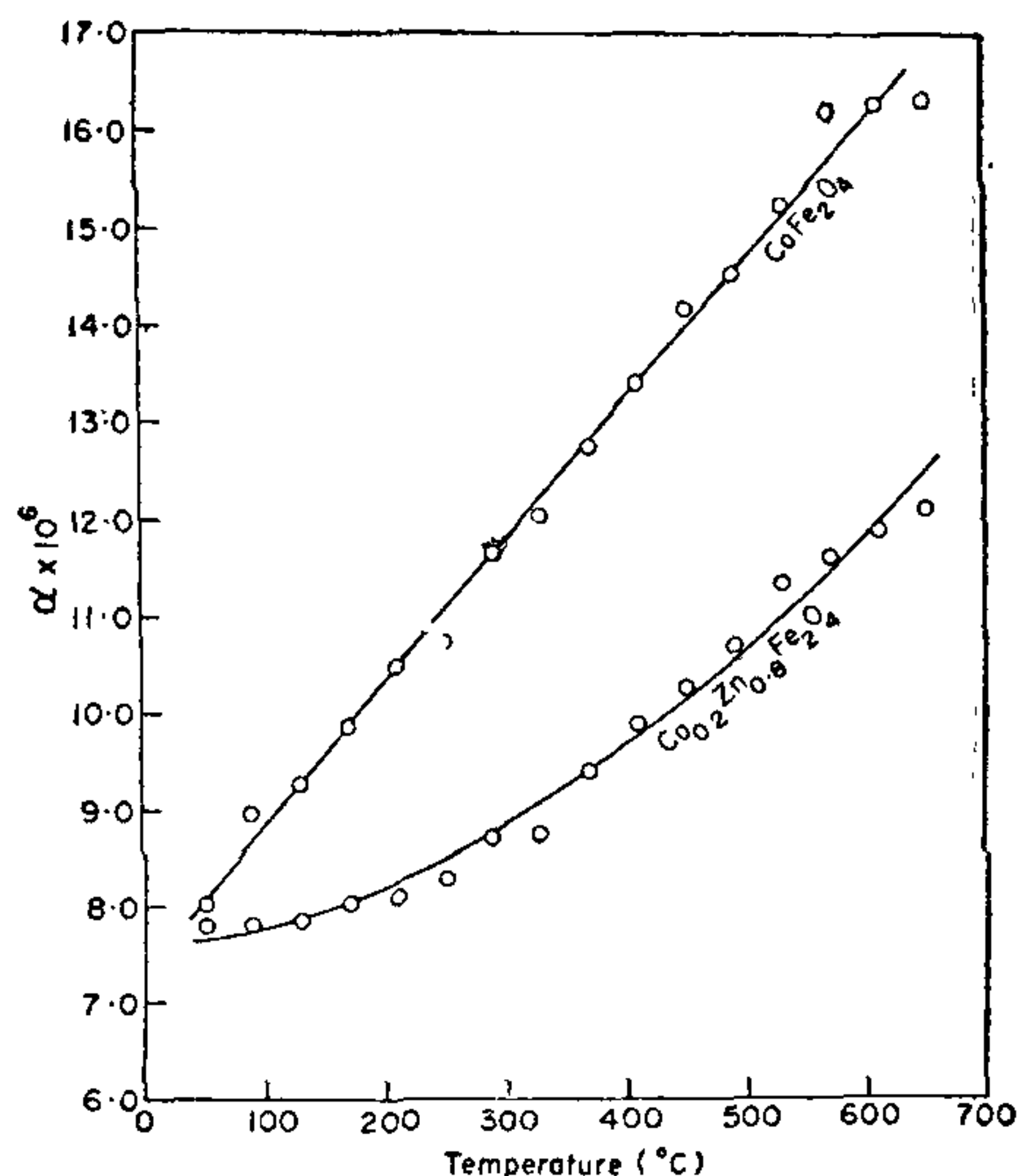Figure 1 shows the variation of the coefficient of thermal expansion with temperature of the two ferrites.

FIG. 1. Variation of the coefficient of thermal expansion of $CoFe_2O_4$ and $Co_{0.2}Zn_{0.8}Fe_2O_4$ with temperature.

From the present study it has been observed that for both these ferrites, the value of α increases continuously with increasing temperature and no anomaly in the thermal expansion has been observed. Recently, Haudek[4] studied the thermal expansion of a number of ferrites in the vicinity of the Curie temperature. However, the detailed paper on this work is not available to enable us to compare our results with his.

We wish to express our sincere thanks to Professor K. V. Krishna Rao for his interest and to Dr. B. Revathi for providing the ferrite samples. Our thanks are also due to the National Bureau of Standards, U.S.A., for financing a Research Scheme under which this work is done.

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GREEN'S FUNCTION FORMALISM AND MOLECULAR FORCE FIELD ELLIPSES FOR XY_4 STRUCTURES

FOLLOWING our earlier paper[1] the molecular force field and other molecular parameters are obtained for $AuCl_4$ planar molecules by adopting Green's function analysis and partitioning techniques. The required mixing parameters to evaluate these constants are determined from the quadratic equation suggested by us[1]. In this procedure for XY_4 planar molecules we made use of a physical constraint, namely, that the repulsive interaction between a bond and an angle adjacent to it is equal to a bond and an angle opposite. This constraint differs from those extensively being used by Müller *et al.*[2].

The object of the present note is to report a study of the molecular force field variation as a function of mixing parameters for XY_4 molecules and also to give comparative data of molecular constants for $AuCl_4$ and $PtCl_4$ with that in literature.

Table I lists two sets of values of the force constants for $AuCl_4$, the data for $PtCl_4$ of the present work and those given by Sabitani *et al.*[3] for $AuCl_4$.

TABLE I

Symmetry force constants for $AuCl_4$ and $PtCl_4$ in units of m-dyne Å for E_u-species

| | AuCl₄ | | | PtCl₄ |
| | Present work | | Sabitani *et al.* | |
	Set I	Set II		
F_{44}	1·88	0·5	2·02	1·406
F_{45}	0	0	0	−0·008516
F_{55}	0·25	0·94	0·25	0·2861

The values given in this note for $PtCl_4$ differ from our previously reported data by numerical factor and are suitable for direct comparison with those in literature.

The Sets I and II of Table I refer respectively to the two mixing parameters which one obtains from the quadratic equation mentioned in the previous paper. The first set appears to be physically reasonable since $F_{44} > F_{55}$. Hence only the corresponding values of mean square amplitude