Table 2. *Powder diffraction data for* Y_2Co_{17}

hkl	d_o	d_c	I_o	I_c
110	4·160	4·167	*vw*	0·4
202	3·101	3·105	*vw*	0·2
113	2·906	2·907	*m*−*s*	2·8
104	2·802	2·807	*m*	2·4
121	2·658	2·661	*vw*	0·1
122	2·486	2·490	*vw*	0·3
300	2·402	2·406	*s*	12·3
204	2·315	2·328	*m*	1·8
105		2·306		2·3
220	2·081	2·083	*vs*	17·9
303	2·066	2·070	*vs*	19·2
124	2·031	2·032	*s*	2·9
006		2·031		13·7
205	2·024	2·020	*m*−*w*	1·8
223	1·850	1·853	*vs*	24·3
116	1·824	1·826	*m*−*s*	5·3
125		1·817		3·1
401	1·785	1·784	*vw*	0·1
402	1·733	1·730	*vw*	0·1
107	1·692	1·693	*w*−*m*	4·9
134	1·670	1·672	*w*	2·1
231	1·640	1·640	*vw*	0·1
232	1·599	1·597	*vw*	0·2
140	1·570	1·575	*vw*	0·2
207		1·568		0·5
404	1·551	1·552	*m*	2·0
306		1·552		2·4
135		1·547		1·1
143	1·467	1·468	*w*	0·8
127		1·468		1·0
234	1·453	1·454	*s*	1·8
226		1·454		10·0
405		1·450		1·1
330	1·388	1·389	*m*	5·3
235	1·368	1·369	*w*	2·0
333	1·314	1·314	*s*	20·0
137		1·313		0·7
504	1·303	1·304	*w*	0·7
119	1·287	1·288	*m*	3·4
244	1·244	1·245	*m*	1·5
146		1·244		3·1
505		1·242		0·9
600	1·203	1·203	*vs*	30·7
1,0,10		1·202		n.c.
237	1·193	1·200	*w*−*m*	0·7
154		1·193		1·5
245		1·190		1·9

Table 3. *Crystallographic data for* YCo_3 *and* Y_2Co_{17}

Compound	*a*	*c*	α	Space group	D_m	D_x
YCo_3	5·015 Å	16·28 Å		$P6_3/mmc$	7·44	7·46
Y_2Co_{17}	5·722 Å		78° 10′	$R\bar{3}m$	8·00	8·02

tetrachloride which prevents oxidation. The powder was strain relieved in evacuated and sealed quartz capillaries at 300 °C during 2 hours. The composition of both compounds was examined by chemical analysis after the heat treatment.

All crystal data were obtained from the alloy powders. X-ray photographs were taken with a 114·6 mm Norelco camera and Co $K\alpha$ radiation ($\lambda = 1\cdot7889$ Å). The YCo_3 and Y_2Co_{17} patterns were both indexed hexagonal (Tables 1 and 2) and there is good agreement between the observed and calculated interplanar spacings. The hexagonal unit cell of the YCo_3 structure has the dimensions $a = 5\cdot015$ Å and $c = 16\cdot28$ Å and it contains six formula units. The Y_2Co_{17} structure shows one formula unit in the rhombohedral unit cell with $a = 5\cdot722$ Å and $\alpha = 78°\ 10'$. The dimensions for the triply primitive hexagonal cell are $a = 8\cdot331$ Å and $c = 12\cdot186$ Å.

Pycnometric density measurements were carried out for each sample. The measured density and the density calculated from the X-ray data are listed under D_m and D_x in Table 3.

The relative intensities of reflections were computed assuming that YCo_3 and Y_2Co_{17} crystallize isostructural to $CeNi_3$ (Cromer & Olsen, 1959) and Th_2Zn_{17} (Markarov & Vinogradov, 1956). The good agreement between the visually observed intensities and the calculated intensities (Tables 1 and 2) shows that there is little doubt that the most probable structures are those given. Some small discrepancies may be caused by preferred orientation. The space groups for the YCo_3 and Y_2Co_{17} structures are presented in Table 3.

The help of Dr. Karl Strnat who prepared the samples is gratefully acknowledged.

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Unit cell, space group and refractive indices of $Al(NO_3)_3.9H_2O$ and $Cr(NO_3)_3.9H_2O$.

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The present study has been undertaken to obtain information on the crystal chemistry of hydrated nitrates about which little structural information is available in literature.

According to Groth (1906), $Al(NO_3)_3 . 9H_2O$ is dimorphic existing in both monoclinic and orthorhombic systems with the following axial ratios:

(i) Monoclinic: $a:b:c = 1\cdot134:1:1\cdot9197$; $\beta = 131°36'$.

(ii) Orthorhombic: $a:b:c = 0\cdot8925:1:1\cdot0202$.

Repeated crystallization from saturated aqueous solution and also from alcohol under slightly varying rates of evaporation and temperature gave us however only monoclinic crystals. No crystallographic details regarding $Cr(NO_3)_3 . 9H_2O$ have been reported so far. Crystals of $Cr(NO_3)_3 . 9H_2O$ have also been grown in a similar manner and have been found from X-ray study to be isomorphous with $Al(NO_3)_3 . 9H_2O$. Transparent but slightly coloured mixed crystals of $Al(NO_3)_3 . 9H_2O)$ diluted with $Cr(NO_3)_3 . 9H_2O$ were also grown.

For X-ray investigation crystals were ground cylindrical to about 0·25 mm diameter. As they were highly hygroscopic they were first soaked in kerosine and enclosed and sealed inside Lindemann glass capillaries. Rotation and Weissenberg photographs taken about the crystallographic axes established the crystals to be monoclinic with a tetramolecular unit cell of the dimensions recorded in Table 1.

Table 1. *Crystal data for* $Al(NO_3)_3 . 9H_2O$ *and* $Cr(NO_3)_3 . 9H_2O$

	$Al(NO_3)_3 . 9H_2O$	$Cr(NO_3)_3 . 9H_2O$
a	13·901 ± 0·015 Å	13·915 ± 0·015 Å
b	9·636	9·681
c	10·903	10·983
β	84°48′	*84°16′
V	1454·4 Å^3	1474·07 Å^3
D_m	1·714 g.cm^{-3}	1·796 g.cm^{-3}
D_x	1·713 g.cm^{-3}	1·802 g.cm^{-3}
Z	4	4
μ	24·92 cm^{-1}	78·92 cm^{-1}

* β^* measured from first layer c-axis photograph by Buerger's (1942) offset method.

Density was determined by flotation, with a mixture of carbon tetrachloride and bromoform.

The systematic absences observed are:

hkl	no conditions
$h0l$	$l = 2n$ present
$0k0$	$k = 2n$ present

Hence the space group is $P2_1/c$.

In the case of $Al(NO_3)_3 . 9H_2O$ the matrix of transformation of the present axes to those given by Groth is

$$\begin{bmatrix} 1 & 0 & \bar{1} \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

The principal refractive indices of the crystals, measured by the oil immersion method for $\lambda = 5893$ Å at room temperature, are given in Table 2.

Table 2. *Refractive indices of* $Al(NO_3)_3 . 9H_2O$ *and* $Cr(NO_3)_3 . 9H_2O$

Refractive indices	$Al(NO_3)_3 . 9H_2O$	$Cr(NO_3)_3 . 9H_2O$
α	1·399 ± 0·001	1·423 ± 0·001
β	1·514	1·532
γ	1·525	1·541
$2V$	34° ± 2°	36° ± 2°

The crystals are optically negative with dispersion violet > red.

We thank Professor R. S. Krishnan for his kind and keen interest and Mr. John S. Louisnathan for his help in the measurement of refractive indices.

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X-ray interference fringes in Berg-Barrett diffraction patterns.

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The interference pattern observed in the Berg–Barrett diffraction pattern of zinc crystals (Armstrong & Schultz, 1964) is interesting. An explanation in terms of Pendellösung effect and the anomalous transmission of X-rays has been given but the authors themselves state that 'the relatively high imperfection content of the zinc crystals makes the observation of interference fringes and anomalous transmission of X-rays unexpected'.

A different explanation seems plausible. Interference between the diffracted beams from two different regions of a crystal, or even from two separate crystals, has been extensively reported with electron beams and a systematic application of this effect for the design of electron-beam interferometers has been discussed. (For a review see Gabor, 1956).

Similarly, the interference of the Bragg-reflected X-ray beams from two regions of the crystal which are slightly misoriented could occur. The optical conditions for such an interference to occur are that (1) the 'coherence length', usually expressed as $\lambda^2/\Delta\lambda$ where λ is the mean wavelength of the characteristic radiation and $\Delta\lambda$, the inherent spectral width, should be small in comparison with the path difference between the two beams and (2) the angle between the interfering wavefronts, $\beta = \lambda/y$ where y is the fringe spacing, should be so small that the fringe spacing can be resolved by the recording instrument. In the present experiment the coherence length turns out to be about 3650 Å taking $\Delta\lambda = 1{\cdot}03$ X.u as the mean width of the iron $K\alpha$ radiation (Compton & Allison, 1935). Taking their observed fringe spacing of the order of 3 microns, the angle β is estimated as about 13 seconds of arc. In the crystal, regions with such a separation and angle of misorientation are reasonably possible when the perfection is only moderate and the interference of the diffracted beams from two such regions seems to be the indicated explanation.

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