Table 3. *Thermal ellipsoids in* $CsUF_6$

	Axis i	R.M.S. amplitude	B_i	Direction angles relative to the rhombohedral cell axes α	β	γ
Cs	1 }	0·182±2 Å	2·61±5 Å²	{ 31	115	115
	2 }			{ 90	138	42
	3	0·220±2	3·84±9	59	59	59
U	1 }	0·150±1	1·79±3	{ 31	115	115
	2 }			{ 90	138	42
	3	0·196±2	3·05±5	59	59	59
F	1	0·237±8	4·43±31	37±8	124±12	70±15
	2	0·188±9	2·79±27	53±8	53±7	124±6
	3	0·260±9	5·34±36	92±14	55±12	41±10

found that the UF_6 octahedra are axially distorted. This observation is in agreement with the present results.

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Determination of particle size and strain in cold-worked magnesium by the method of variance.

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The method of variance was used to determine particle size and strain in cold-worked magnesium. The results are discussed and compared with those obtained by line shape analysis.

X-ray line broadening investigation of deformed metals has mainly been confined to cubic structures. Few hexagonal metals and alloys have so far been studied. Lele & Anantharaman (1964) have studied the deformation of hexagonal magnesium by the method of integral width. They did not consider the individual contributions of particle size and strain to the line broadening but attributed the entire broadening to either size effects or strain effects. Recently Mitra & Misra (1967) have determined particle size and strain in cold-worked magnesium by line shape analysis using single-line technique. No other work on X-ray line broadening study of cold-worked magnesium has been reported. In this work we present the results of the application of the method of variance to the determination of particle size and strain in deformed magnesium.

The variance of a line profile is an explicit function of the range and hence depends largely on the error in the assumed background of the profile. The dependence of variance on the background error has been discussed by Berry (1966) and by Mitra & Misra (1966). Mitra & Misra (1966) have also developed a method of correcting the background error which has been applied in the present case. The variance of a line profile corrected for background varies linearly with range (in 2θ) in a region where the intensity decreases as the inverse square of the range. Considering the entire diffraction broadening to be due to particle size and strain, the variance of a line profile in 2θ is given by Wilson (1963); this may be rearranged according to Mitra (1964):

$$\frac{W\cos\theta}{\lambda\sigma} = \frac{1}{2\pi^2 p} + \frac{n^2\lambda}{\sigma\cos\theta}\cdot\frac{\langle e^2\rangle}{d^2} \qquad (1)$$

where $p=t/K$ is the apparent particle size, t is the real particle size, d is the interplanar distance, $d/n=\lambda/2\sin\theta$, θ is the Bragg angle, σ is the angular range in 2θ and $\langle e^2\rangle$ is the variance of strain. The taper parameter in equation (1) has been assumed to be zero. By proper change of axes, reflexions of the type hkl, $2h2k2l$ *etc.* can be treated as $00l_0$, $002l_0$ *etc.* reflexions for each of which the Scherrer constant $K=1$ (Wilson, 1962). Since higher order reflexions are not available in the present case, we have used equation (1) to analyse each line separately, putting $n=1$. The line

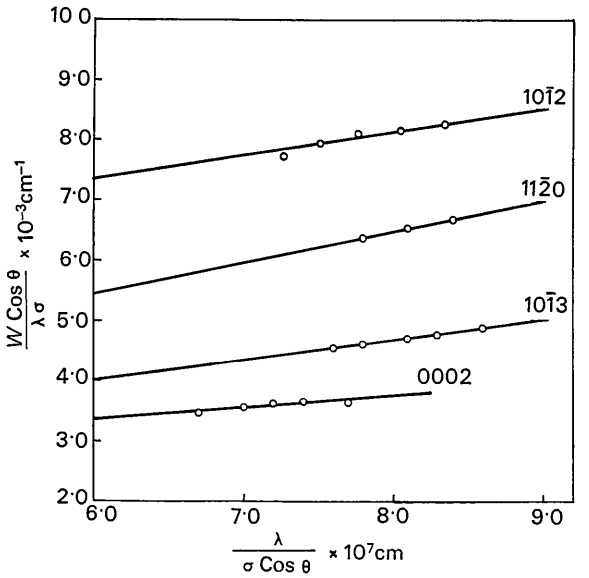

Fig. 1.

profiles used in the present investigation are those of Mitra & Misra (1967). Variances for 0002, $10\bar{1}2$, $11\bar{2}0$ and $10\bar{1}3$ reflexions have been determined both for deformed and annealed samples as functions of equal ranges σ (in 2θ) and hence those for pure diffraction profiles were obtained as a function of ranges σ (in 2θ). Plots of $W\cos\theta/\lambda\sigma$ *versus* $\lambda/\sigma\cos\theta$ as shown in Fig. 1 are straight lines as expected from equation (1). Particle size and strain are determined from the intercepts and slopes respectively along different directions and the results are shown in Table 1 with those obtained by Mitra & Misra (1967) by line shape analysis. Since the entire line broadening is not attributed to the particle size effect and strain effect by Lele & Anantharaman (1964), their results on cold-worked magnesium cannot be compared here.

Table 1 shows that particle size and strain determined by the present method are respectively greater (except for the 0002 reflexion) and smaller than those obtained by line shape analysis. These results are in conformity with those obtained by previous workers. For example, Michell &

Table 1. *Particle size and strain by different methods*

Lines	Particle size (Å)		Strain (10^{-3})	
	Variance method	Line shape analysis	Variance method	Line shape analysis
0002	563	720	1·46	7·58
$10\bar{1}2$	1013		1·18	
$11\bar{2}0$	1754	880	1·09	7·89
$10\bar{1}3$	2252	800	0·81	7·95

Haig (1957), Michell & Lovegrove (1960), Mitra (1964) have obtained different values of particle size and strain using different methods. Recently Aqua (1966) has investigated cold-worked aluminum using all the methods and has shown that when the proper angular range of integration is chosen, the particle size by each method is of the same order of magnitude. He has also shown that the average strain determined by the Fourier analysis is less than that obtained by integral breadth and variance, though the order of magnitude in the three cases is almost the same. The definition of strain and particle size is not same in each case so that some differences in particle size and strain values are not unexpected. Anisotropy in particle size is more prominent than that in strain. Since magnesium is elastically isotropic, the apparent strain anisotropy is perhaps due to limitations of experimental accuracy and the average value is probably the true value of strain. The particle size anisotropy may be attributed to a non-spherical shape of the particles which has not been taken care of by taking $K=1$.

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The coherent neutron scattering amplitudes for seven isotopes of tin.*

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Scattering amplitudes were determined for the isotopes 116 through 120, 122 and 124 from an examination of the neutron powder patterns of SnO_2.

Coherent scattering amplitudes for thermal neutrons of the seven most abundant of the ten natural isotopes of tin were determined from an examination of the neutron powder patterns of SnO_2. Samples of SnO_2 were obtained from Oak Ridge National Laboratory, each enriched in one of the seven tin isotopes (ranging from 78·8% for ^{117}Sn to 98·4% for ^{120}Sn), and scanned from 16° to 46° in 2θ using neutrons of wavelength 1·064 Å. The cylindrical, tightly packed powder samples measured 2 cm in diameter by 3 cm long and were enclosed in a fused-quartz tube during ex-

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