$\bar{1}0.2$ and increases of 13% in breadth and 17% in integrated intensity for 10.3, while the four insensitive reflections show changes of less than 1·3%. Real alloys have shown ω-particles with average sizes as small as a 7|**c**| length and only a 4-unit-cell cross-section (Keating & LaPlaca, 1974).

We have presented here a calculation of a small-particle-size effect for a model of ω-phase precipitates in alloys that results in increases in breadths and integrated intensities for certain sensitive reflections. The important feature of the model is the existence of reflections with rapidly varying geometrical structure factors, so similar effects should be expected for sensitive reflections of other multi-atom structures of sufficiently small particle size. These calculations are given some support by our observation (Walker, unpublished) of excess broadening of sensitive ω-phase reflections from a quenched alloy of Ti with 19% V, but no quantitative comparison has yet been possible.

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X-ray linear absorption coefficient of silicon for Cu $K\alpha$ and Mo $K\alpha$ radiations.

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The X-ray mass attenuation coefficients of silicon for Cu $K\alpha$ radiation have been measured and found to be 56·9 (3) and 6·09 (3) cm^2 g^{-1} respectively.

A method of determining accurate X-ray attenuation coefficients using single crystals has been described by Lawrence & Mathieson (1976). The method involves measuring the intensity of the transmitted beam, I_t, passing through a specimen of thickness t, whose faces are accurately parallel and whose cross section is greater than that of the main beam, as the beam makes varying angles φ with the normal to the crystal face. Then,

$$I_t = I_0 \exp(-\mu t/\cos\varphi) = I_0 \exp(-n\mu t).$$

A plot of $\log_e I_t$ against n will yield values of μt from which μ can be determined. The value of I_0 can also be obtained and compared with the directly measured value. The presence of white radiation and harmonic components in the main beam may make these values different and may also lead to deviations from linearity in the plot.

This possible source of error has been eliminated by monochromatizing the main beam with the 111 reflexion from a near-perfect silicon crystal. Since the 222 reflexion is very weak, no harmonics should be present and the very small divergence of the diffracted beam will eliminate variations in the path length through the crystal which may be significant for large n.

No recent experimental determination of the absorption coefficient of silicon appears to have been carried out and because of its large abundance and of its large number of chemical compounds, it was felt that an accurate measurement of its absorption coefficient would be useful.

A single crystal of silicon, whose cross section was a square of side 0·7 cm, was used. The thickness of the crystal was measured systematically over the surface traversed by the X-ray beam with a linear differential transducer (model ER/0·100, manufactured by Sangamo Weston Controls Limited) which had been carefully calibrated using slip gauges. The mean thickness was found to be 0·05107 (15) cm.

With Cu $K\alpha$ radiation, the beam from the monochromator was collimated by a circular aperture of radius 0·1 mm and the crystal centred on a two-circle spectrometer. The intensities were measured by a scintillation counter attached to a Siemens counting chain. For each value of φ, four equivalent transmitted intensities were measured, *i.e.* at $\pm\varphi$ and $180\pm\varphi$, and the average intensity used. Intensities were measured at intervals of 5° from $\varphi = 0$ to $\varphi = 30°$ and at intervals of 2° from $\varphi = 32$ to $\varphi = 60°$.

The count rate at $\varphi = 0°$ was set to about 4000 counts per second. Sufficient counts were recorded at each setting to ensure that the counting statistics error on the average of the four settings was of the order of 1%. The errors quoted are those obtained from a least-squares fit.

From the resulting graph of $\log_e I_t$ against n, a value of μt of 6·76 (3) was obtained giving $\mu = 132{\cdot}4$ (7) cm^{-1} and $\mu/\varrho = 56{\cdot}9$ (3) cm^2 g^{-1} taking $\varrho = 2{\cdot}3283$ g cm^{-3} (Straumanis & Aka, 1952). The value quoted in *International Tables for X-ray Crystallography* (1974) is 65·32 cm^2 g^{-1} with an error in the range 2 to 5%. Even if the maximum error is assumed, it must be concluded that the two values are significantly different.

With Mo $K\alpha$ radiation, the values were $\mu = 14{\cdot}18$ (7) cm^{-1} and $\mu/\varrho = 6{\cdot}09$ (3) cm^2 g^{-1}. This can be compared with the value of 6·533 cm^2 g^{-1} quoted in *International Tables* (1974).

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