reflexion, on for example the 111 set, for which the above condition is fulfilled. In the attempt to do so the deviation parameter on some non-systematic reflexion necessarily becomes sufficiently small to reduce the visibility of the moiré fringes to an unacceptable level. Considering the latter condition, quite strong variations in the fringe spacing, of more than 10%, were found in the computed profiles on varying the deviation parameter of the strong reflexion by as little as 2×10^{-3} $\AA^{-1}$. It might be thought that this greatly reduces the reliability of the technique. This turns out not to be so, since the visibility of the fringes falls off very rapidly away from the exact $w_{2g}=0$ condition. Indeed it was not found to be possible to measure experimentally the spacing of fringes produced under a condition which would have given, according to the computed profiles, a departure from the naive relation of more than about 7%. A third possible source of error might be expected to arise from the measurement of moiré fringes on particles near to a free surface of the foil. Experimentally it was found that the fringe spacing was not markedly altered, until the particle reached to within $r_0/2$ of a foil surface. The spacing of the fringes then becomes variable across the diameter of the particle, wider spacings being seen where the particle is nearest to the surface. Such moiré images are readily noticeable and would not be measured in any systematic set of results used for the determination of ε.

To summarize, our contrast calculations have shown that if fringes are formed with sufficient visibility to be measured, and if they appear to be uniform in visibility and separation across the particle, then the naive relation can be used to give a direct measure of the *in situ* misfit with an accuracy, limited by the knowledge of the microscope magnification, of better than $\pm10\%$. Experimentally perhaps the main danger is setting up a condition for which a non-systematic reflexion is affecting the image. Such images are readily discardable since the moiré fringes are not then perpendicular to *g*.

4. Applications of the method

The inherent accuracy and independence of the technique of the elastic constants of the matrix and inclusion suggest a number of potential applications. For example, if ε is determined for a particle and if its unstrained lattice dimensions are known, its bulk modulus may be found. Alternatively, if the moduli and lattice parameters of the inclusion and matrix are known, limits may be set on the degree to which the particle might be non-spherical (Richards & Stobbs, 1975). A more complex problem, which should be tractable by application of the technique, would be to follow the processes by which a particle becomes incoherent. As successive prismatic loops surround a particle on different slip systems, the direction, and spacing, of the moiré fringes should vary relative to the direction of the excited reflexion.

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References

ASHBY, M. F. & BROWN, L. M. (1963*a*). *Phil. Mag.* **8**, 1083–1103.
ASHBY, M. F. & BROWN, L. M. (1963*b*). *Phil. Mag.* **8**, 1649–1676.
DEGISCHER, H. P. (1972). *Phil. Mag.* **26**, 1137–1151.
ESHELBY, J. D. (1957). *Proc. Roy. Soc.* A**241**, 370–396.
MOTT, N. F. & NABARRO, F. R. N. (1940). *Proc. Phys. Soc.* **52**, 86–89.
RICHARDS, C. G. & STOBBS, W. M. (1975). To be submitted to *Phil. Mag.*
SASS, S. L., MURA, T. & COHEN, J. B. (1967). *Phil. Mag.* **16**, 679–690.
WOOLHOUSE, G. R. (1973). *Phil. Mag.* **28**, 65–83.

J. Appl. Cryst. (1975). **8**, 228

Studies of the Nature of Clusters in Gold Obtained with 2·5 MeV Electrons

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Irradiation studies have been performed in gold samples bombarded with electrons [Ruault, M. O. & Jouffrey, B. (1972). *C. R. Acad. Sci. Paris Sér. B*, p. 451; Yoshida, N. & Kiritani, M. (1973). *Cryst. Lattice Defects*, **4**, 83–94; *J. Phys. Soc. Japan*, **35**, 1418–1429]. Experiments have been carried out with gold samples (99·9999%) located inside a helium decontamination device (vacuum $\sim10^{-8}$ mm Hg) in a 3 MeV microscope. Defects produced at 2·5 MeV at first are of interstitial nature. For a higher dose ($\sim10^{21}$ e/cm^2) it seems that small defects (assumed to be of vacancy nature) are formed inside the loops. Continuation of the irradiation produces ordering of small tetrahedra of stacking faults (20 Å $< D <$ 100 Å) over the whole area of the micrographs of the sample. This ordering was studied by laser diffraction; the higher the doses, the better the ordering.