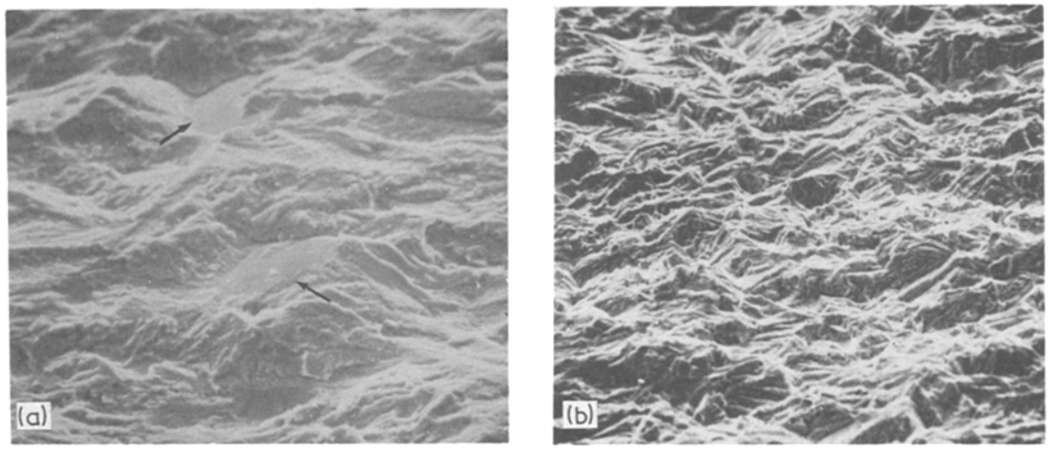

Figure 4 Fracture surfaces of 316 steel, (a) in air at ambient temperature. Two facets are visible; (b) in sodium at 500° C. Facets are not observed. × 480.

electron microscope photographs of the 316 steel fracture surfaces from room temperature and tests at 500° C in sodium.

It is thought that cleavage in f c c materials should occur on the {1 1 1} planes and this has been observed in stage I fatigue in nickel and aluminium alloys [5]. The faceted fracture areas in the 316 steel of 3 grains/mm size have been examined by X-ray diffraction which has indicated that cleavage does in fact occur on the {1 1 1} plane.

Acknowlegement
This letter is published by permission of the Central Electricity Generating Board.

References

1. E. K. PRIDDLE and F. E. WALKER, C.E.G.B. Report RD/B/N3384 (in preparation).
2. E. T. WESSEL, *Eng. Fract. Mech.* 1 (1968) 77.
3. R. O. RITCHIE and J. F. KNOTT, *Mat. Sci. Eng.* **14** (1974)
4. E. K. PRIDDLE and C. WILTSHIRE, *Int. J. Fract.*
5. W. J. PLUMBRIDGE and D. A. RYDER, *Met. Rev.* **136** (1969).

Received 19 August and accepted 8 September 1975

E. K. PRIDDLE
F. E. WALKER
Berkeley Nuclear Laboratories, Berkeley, Gloucestershire, UK

A specimen for evaluating the area of SACPs

Most commercial scanning electron microscopes now offer the capability of obtaining selected-area channelling patterns, SACPs. Different electron optical techniques are used to obtain the SACPs and on the various machines it is difficult to evaluate the minimum area from which the channelling pattern is being generated. In this paper we discuss the preparation of an Al–Ge sample which has proven to be very effective in evaluating the minimum area of SACPs.

An alloy of Al–60 wt % Ge is prepared by melting the elements in a 1 in. diameter graphite crucible under an inert atmosphere and then fur-

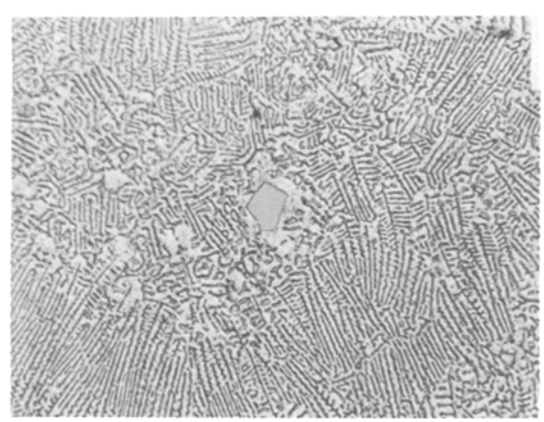

Figure 1 Ge particles in the central region of the ingot. Optical micrograph, × 60.

nace cooling. Primary Ge dendrites form at the graphite wall and the interior of the ingot has the characteristic irregular eutectic morphology of Ge alloys. However, in the central region of the 1 in. ingot there are numerous small Ge particles ranging in size from around 5 to 80 μm as is shown in Fig. 1. A transverse sample cut from the centre of the ingot contains large Ge dendrites (on order of 1 mm in size) at its edge and a range of smaller sized particles at its centre. It is very easy to obtain an SACP on the larger dendrites and, therefore, these regions are useful for initial set-up. The smaller particles in the central region may be used to determine the minimum size SACP area.

The surface is prepared by standard metallurgi-

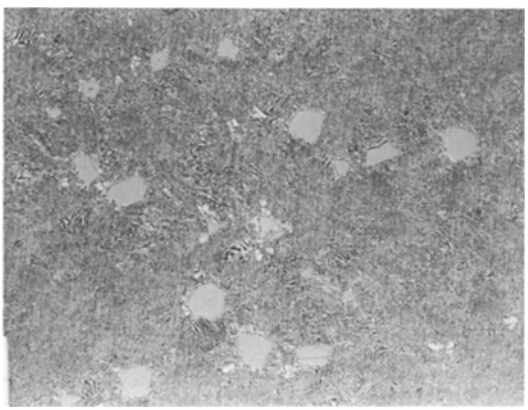

Figure 2 A 10 μm Ge particle surrounded by the Al–Ge eutectic structure. Optical migrograph, × 463.

cal polishing techniques. Final polishing is done with Linde A on wax followed by a short polish with Linde B on cloth. The specimen is then electrolytically etched for around 3 sec at 6 V using 6% oxalic acid in water. After this etch channelling patterns are obtained from the Ge phase but not the aluminium phase. Apparently the etch leaves a film of some type on the aluminium phase.

Figs. 2 and 3 illustrate the use of the Al–Ge specimen in evaluating that area of a specimen which contributes to the channelling pattern. The particle shown at the centre of Fig. 2 has an average dimension of approximately 10 μm. A chanel-

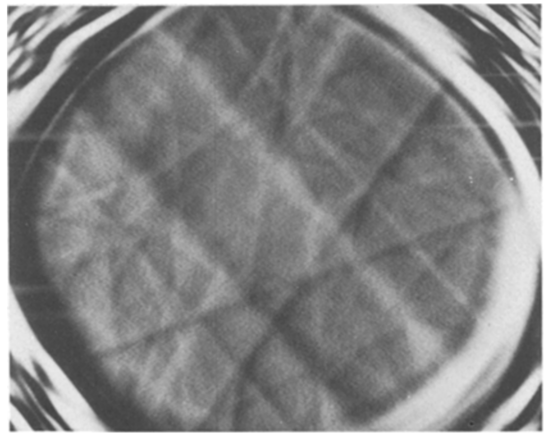

Figure 3 An SACP of the Ge particle of Fig. 2. Specimen current mode, working distance of 1 mm, 20 kV. (Reduced for reproduction by 0.6.)

ling pattern of this particle taken on a Cambridge S-4 SEM is shown in Fig. 3. The outline of the particle may be seen in the corners of the figure. Hence, we determine that for the conditions of Fig. 3 the central 10.2 cm of the pattern on the original photograph arises from an area on the specimen surface of 10 μm. The outline of the particle shows up clearly upon the channelling patterns because of the small irregular morphology of the surrounding eutectic structure.

The band running diagonally from upper left to lower right is from the {2 2 0} planes. From the bandwidth the pattern size is found to be 1.08 degrees per cm of photograph. Hence, under the conditions of Fig. 3 the SEM has provided a pattern from a 10 μm region which encompasses a circle of 11 degrees on the channelling map.

Received 16 July
and accepted 29 July 1975

J.D. VERHOEVEN
H.H. BAKER
Ames Laboratory, US ERDA,
and Department of Metallurgy,
Iowa State University, Ames,
Iowa, USA