METALLURGY

G Phases containing Scandium

We have noted the occurrence of a *G* phase (structure type *D8a*) in the Sc-Ni-Si, Sc-Co-Si and Sc-Ni-Ge systems. Alloys were made by arc melting in a water-cooled copper crucible under argon. Diffraction patterns were taken with copper radiation on powder annealed at 900° under vacuum. The composition and lattice parameters of the newly found *G* phases are given in Table 1.

Table 1. Lattice Parameters of *G* Phases

Composition	a_0 (Å)
$Sc_6Ni_{16}Si_7$	11·429
$Sc_6Co_{16}Si_7$	11·438
$Sc_6Ni_{16}Ge_7$	11·663

We failed to detect a *G* phase in the following alloys: $U_6N_{16}Si_7$, $Y_6Ni_{16}Si_7$ and $Th_6Ni_{16}Si_7$, but we confirm the existence of a *G* phase in $Nb_6Ni_{16}Si_7$ (ref. 1).

Gladyshevskii *et al.*[1] have reported data for *G* phases of the generalized formula $A_6Ni_{16}Si_7$ in which *A* may be Ti, Zr, Hf, V, Nb, Ta, Cr (with 1 *a*/0 Ta) or Mn. Our data extend this list to include Sc but not Y. It is noted that the *A* element may come from groups III*b* to VII*b* of the Periodic Table, but is restricted to atoms having small to intermediate size, that is, Mn to Sc.

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Aluminium Nitride Whiskers

In the course of an investigation into the stability of certain nitrides, whisker growth has been observed on aluminium nitride. Aluminium nitride powder was prepared from the elements, cold pressed at 15 tons/in.^{2} and sintered for 4 h at 1,750° C in high purity argon. The sintered compacts measured approximately 8 mm in diameter by 4 mm high. X-ray powder photographs of filings of the sintered nitride showed the structure to be hexagonal, close-packed (a near-wurtzite structure according to Jefferey and Parry[1]) with $a = 3{\cdot}11$ Å and $c = 4{\cdot}98$ Å. The sintered density was 68 per cent of theoretical and the Vickers micro-hardness 1,010 ± 15 kg mm^{-2}.

A stack of three compacts was mounted under a bell jar in an arc image furnace[2] and the uppermost one heated, in an atmosphere of high-purity nitrogen. The initial nitrogen pressure was 745 mm and the pressure at the end of the heating period was 750 mm. The following sequence of events was observed on the heated surface as the temperature was increased: (*a*) short 'woolly' filaments formed; (*b*) longer filaments grew normal to the surface; (*c*) nodes formed on these filaments and growth continued; (*d*) 'fir-tree' growth occurred from these nodes. This latter growth appeared to act as centres of sublimation and the needles decreased in height. There was no sign of melting. Stage (*d*) was accompanied by the formation of a thin film (presumably aluminium nitride) on the inside of the bell jar.

When heating was stopped after stage (*b*) it was found that the needles were hexagonal prisms about 1,600μ long by 20μ thick and almost transparent. They could be bent through an angle of about 15° before fracture occurred.

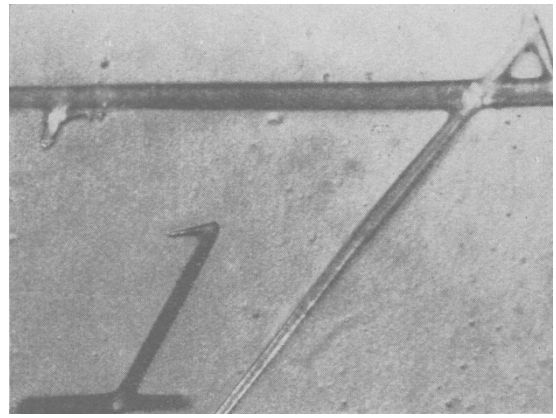

Fig. 1. Aluminium nitride needles; reflected light. (× *c*. 375)

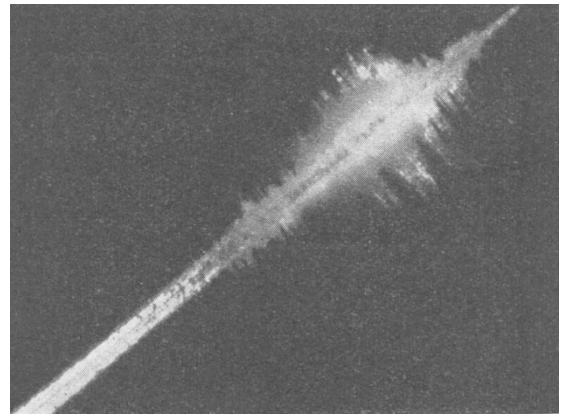

Fig. 2. Sublimation stage ('fir-tree' growth) during heating of aluminium nitride whiskers; transmitted light. (× *c*. 560)

Specimens examined after stage (*c*) showed well-defined nodes (Fig. 1.) separating transparent hexagonal prismatic crystals. The fir-tree growth (stage (*d*)) is shown in Fig. 2.

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[2] Evans, P. E., and Wildsmith, G., *Brit. J. App. Phys.*, **13**, 68 (1962).

CHEMISTRY

Oxidation of Plutonium in Moist Air and Argon

The only published works on the oxidation of plutonium are by Waber[1], Poole[2] and Sackman[3]. Waber and Sackman's work was carried out only in air at temperatures < 100° C, whereas Poole's work was at 320°–480° C in air. In order to understand the mechanism of oxidation, we have found it necessary to compare the oxidation-rate of plutonium in air and in argon under both dry and humid conditions at a temperature sufficiently low that changes in oxidation behaviour are readily detected. Results presented here indicate that oxidation is anodically controlled.

Abraded specimens of plutonium (both cast disks and rolled sheet) were oxidized for 1,800 h in air and in argon at room temperature and 95 per cent relative humidity. Despite some irreproducibility of results caused by varia-