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A new hexagonal phase between $\mathrm{Au_4Mn}$ and $\mathrm{Au_3Mn}$.

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In the course of a study of the gold-manganese equilibrium diagram a new hexagonal η phase has been observed in the region between $\mathrm{Au_4Mn}$ and $\mathrm{Au_3Mn}$. It has a very narrow range of homogeneity and has not been observed entirely as a pure phase. We have established that it is centred very near to 23·8 at.% Mn and exists up to about 620 °C. above which temperature it reverts to the α f.c.c. solid solution of manganese in gold.

Alloy samples have been examined both in a high-temperature X-ray camera and in a quenched condition. The data given in Table 1 was obtained from a powder sample of alloy 23·6,* which was quenched after three days at 490 °C. and photographed at room temperature using Cu $K\alpha$ radiation. This enabled the structure to be identified as hexagonal, the cell dimensions determined by Cohen's method being:

$$a = 2{\cdot}8578 \pm 0{\cdot}0003,\ c = 4{\cdot}7297 \pm 0{\cdot}0003\ \text{Å}\ ,\quad c/a = 1{\cdot}6550,\ \text{at}\ 22\ ^\circ\text{C}.$$

Table 1. *Data for the η phase in alloy* 23·6

$hk{\cdot}l$	d_o	d_c	I_o	I_c
10·0	2·465 Å	2·477 Å	*mw*	8
00·2	2·357	2·367	*m**	37
10·1	2·186	2·195	*vs*	100
10·2	1·706	1·711	*w*	5
11·0	1·426	1·413	*ms*	22
10·3	1·3273	1·3312	*m*	20
20·0	1·2388	1·2375	*vw*	0·9
11·2	1·2212	1·2230	*ms*	27
20·1	1·1952	1·1972	*mw*	14
00·4	1·1807	1·1824	*w*	3·7
20·2	1·0963	1·0964	*vw*	1·2
10·4	1·0666	1·0669	*vw*	1·2
20·3	0·97306	0·97343	*mw*	9·6
21·1	0·91762	0·91807	*m*	19·5
11·4	0·91091	0·90992	*m*	17·4
10·5	0·88350	0·88360	*mw*	9·6
21·2	0·87048	0·86987	*w*	2·4
20·4	0·85471	0·85490	*vw*	1·3
30·0	0·82461	0·82499	*vw*	0·8
21·3	0·80448	0·80449	*s*	36
00·6	0·78818	0·78829	*mw*	7
30·2	0·77900	0·77895	*s*	61

$\lambda\alpha_1$ = 1·54051 Å for reflections above 11·0; λ_{wm} = 1·54178 Å below 11·0.

I_o = visually estimated intensity (*vs* = very strong; *s* = strong; *m* = medium; *w* = weak).

* The 00·2 line was near to the 111 line of the orthorhombic α'' structure mentioned in the text.

I_c = calculated intensity for a 'mean atom' of atomic number 66. No correction for absorption and temperature was applied.

Density of alloy $\doteqdot M$ 16 g.cm.$^{-3}$. Theoretical density for $A3$ structure = 16·16 g.cm.$^{-3}$.

The calculated intensities I_c shown in the table are in agreement with the $A3$ type of structure with the gold and manganese at random in the hexagonal lattice.

Between the η phase and the tetragonal α' structure of $\mathrm{Au_4Mn}$ (Kussmann & Raub, 1956; Watanabe, 1960*a*) there exists an orthorhombic structure α''. A small amount of this phase occurred in the sample of Table 1. α'' was found as a pure phase between about 21·0 and 22·2 at.% Mn after appropriate heat treatment. In alloy 21·0 quenched from 445 °C. the lattice parameters of its fundamental cell are

$$a = 4{\cdot}0814 \pm 0{\cdot}0003,\ b = 4{\cdot}0599 \pm 0{\cdot}0003\ ,\quad c = 4{\cdot}0377 \pm 0{\cdot}0003\ \text{Å}\ .$$

α'' changes to tetragonal α' in this alloy below about 400 °C., in which state it is ferromagnetic at room temperature. In alloy 24·0 η coexisted with a complex structure, presumably $\mathrm{Au_3Mn}$ (Watanabe, 1960*b*).

A detailed account of the equilibrium diagram in this region will be published elsewhere.

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* Alloy 23·6 means an alloy of composition 23·6 at.% Mn.

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Kristallographische Daten des Selenocarbohydrazids, $\mathrm{CSe(NH{-}NH_2)_2}$.

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Aus Drehkristall-, Goniometer- und Retigraphenaufnahmen um die verschiedenen Achsen eines aus wässriger Lösung gewonnenen Kristalls ergaben sich für die Gitterkonstanten des monoklin kristallisierenden Selenocarbohydrazids (Fehér *et al.*) folgende Werte:

$$a = 6{,}16,\ b = 15{,}50,\ c = 4{,}81\ \text{Å};\ \beta = 96^\circ\ 59'.$$

Die Elementarzelle ist mit 4 Molekeln Selenocarbohydrazid besetzt, die Dichte lässt sich danach zu 2,216 g.cm.$^{-3}$ berechnen.

Aus den Auslöschungen folgen für diese Verbindung die Raumgruppen $C_2^2{-}P2_1$ und $C_{2h}^2{-}P2_1/m$.

Aufgrund von Modellbetrachtungen ergibt sich unter Berücksichtigung einer möglichst guten Raumerfüllung ein recht plausibler Strukturvorschlag, der z.Zt. noch durch Intensitätsmessungen geprüft wird.

Literatur

Fehér, F., Hirschfeld, D. & Linke, K.-H. (1962). *Z. Naturforsch.* (Im Druck.)