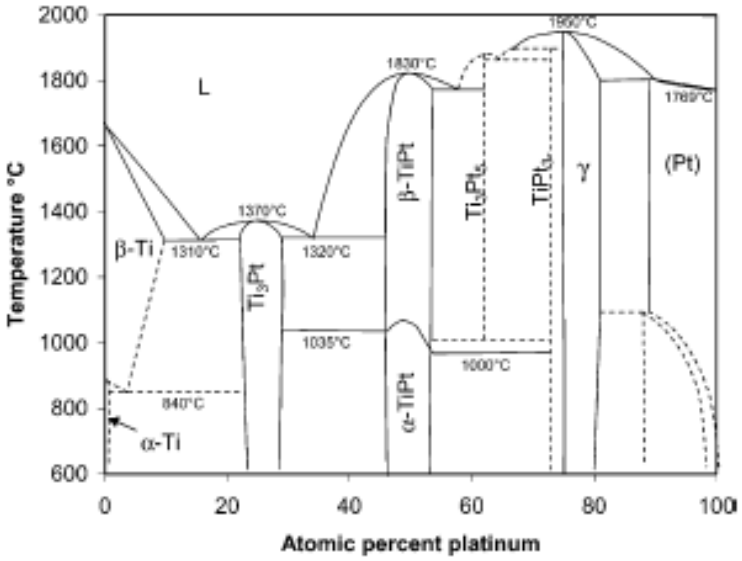


Fig. 1. Ti–Pt phase diagram after Murray [4].

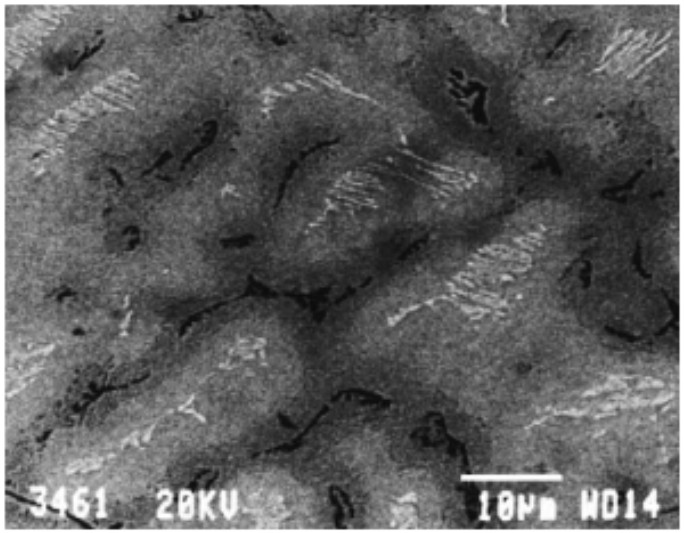


Fig. 4. SEM image in backscattered mode of 42.7 at.% Pt, heat-treated at 800 °C 1 h, and furnace cooled. Remnants of α-TiPt (white) within cored Ti_4Pt_3 dendrites (medium greys) and intergranular mixture of oxide + Ti_4Pt_3 eutectic.

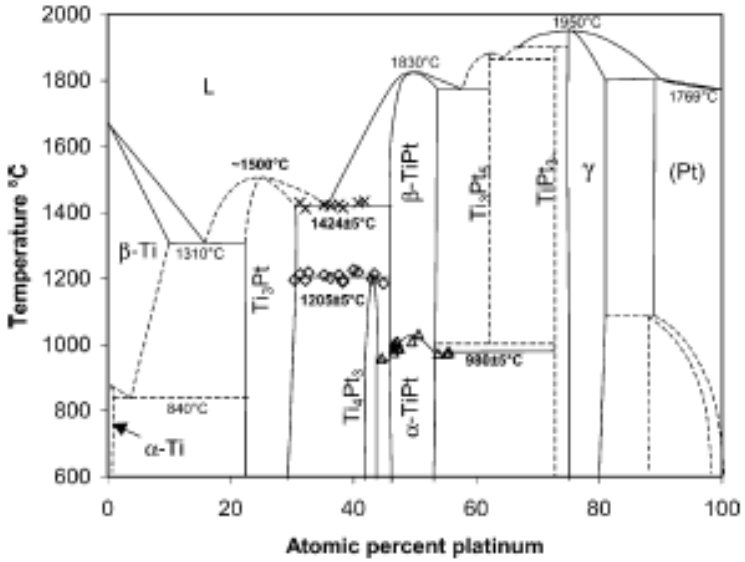


Fig. 11. Revised Ti–Pt phase diagram, showing new phase Ti_4Pt_3, increased melting point of Ti_3Pt and slightly modified α/β boundary in TiPt.

A new phase: Ti_4Pt_3

Formed peritectoidally:

$Ti_3Pt + \beta TiPt \rightarrow Ti_4Pt_3$

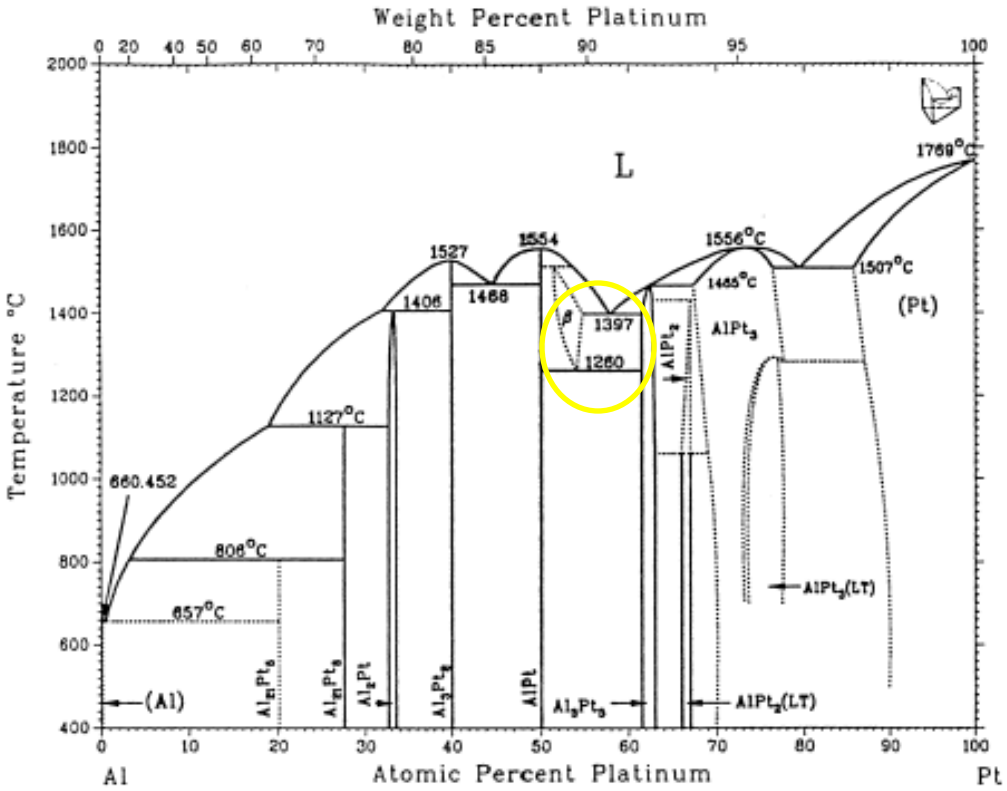


Fig. 1. Binary Pt–Al equilibrium phase diagram [11].

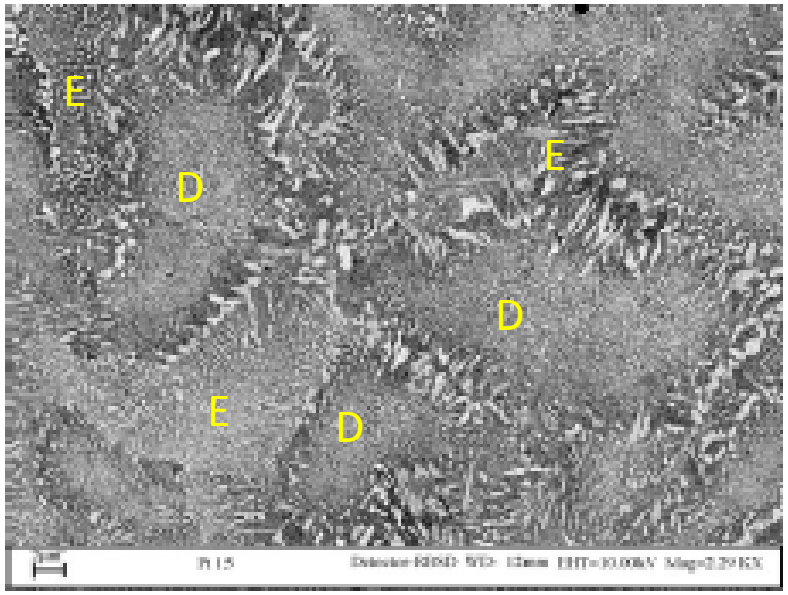


Fig. 2. SEM image in backscattered mode of ~Al_{12}:Pt_{35}:Ru_2 (Alloy 15) showing the varying morphology for eutectic (coarser) and prior dendritic (finer) regions: ~Pt_5Al_3 (light) and ~PtAl (dark).

Eutectoid reaction: $\beta \rightarrow PtAl + Pt_5Al_3$

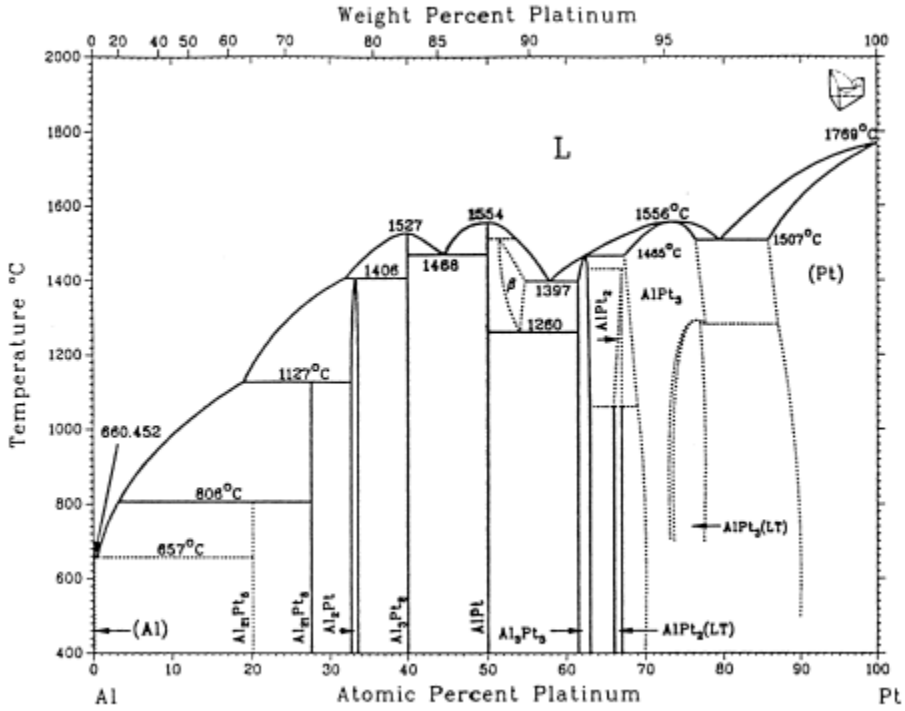
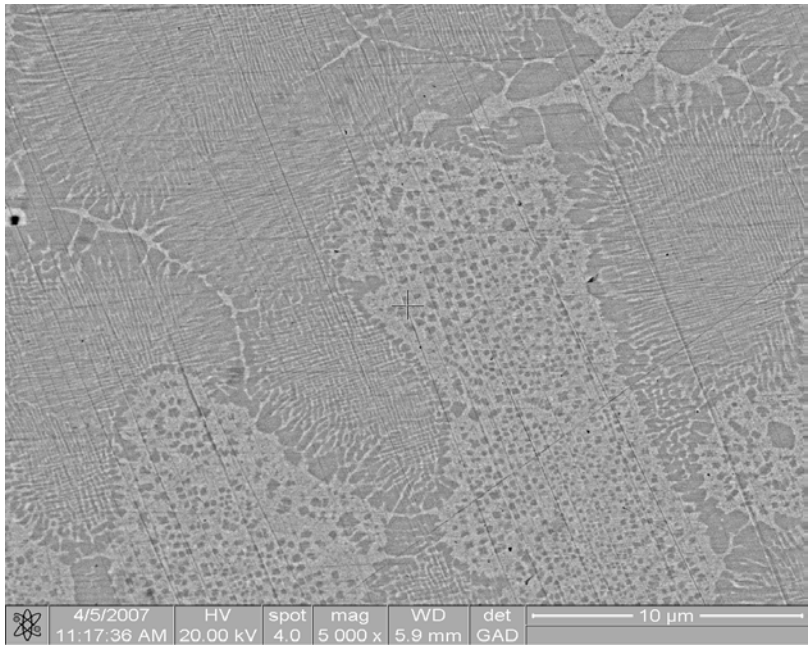
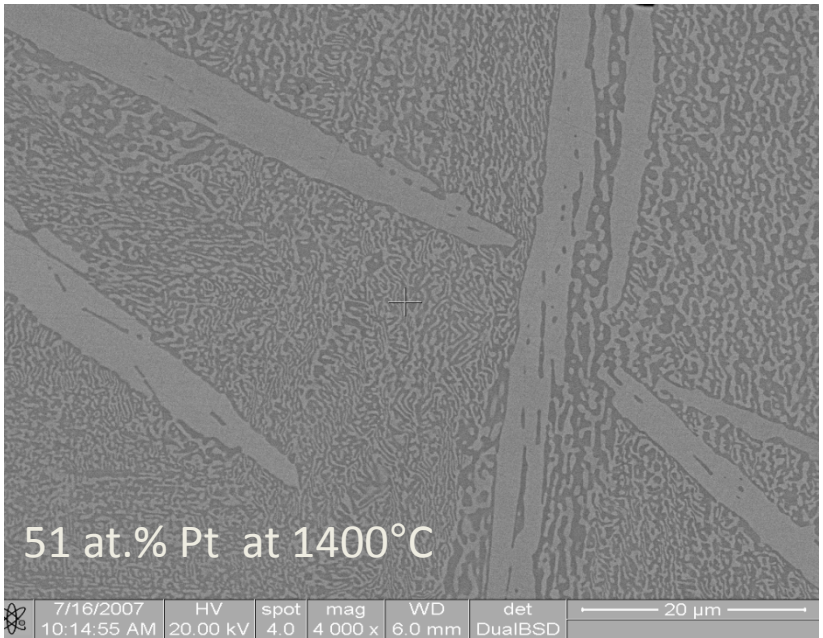
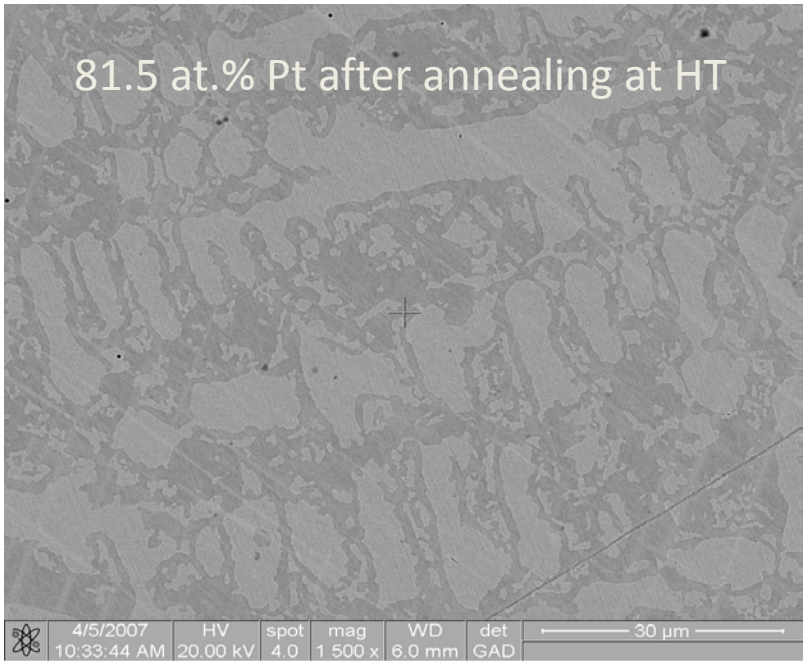


Fig. 1. Binary Pt–Al equilibrium phase diagram [11].

81.5 at.% Pt in the as-cast condition







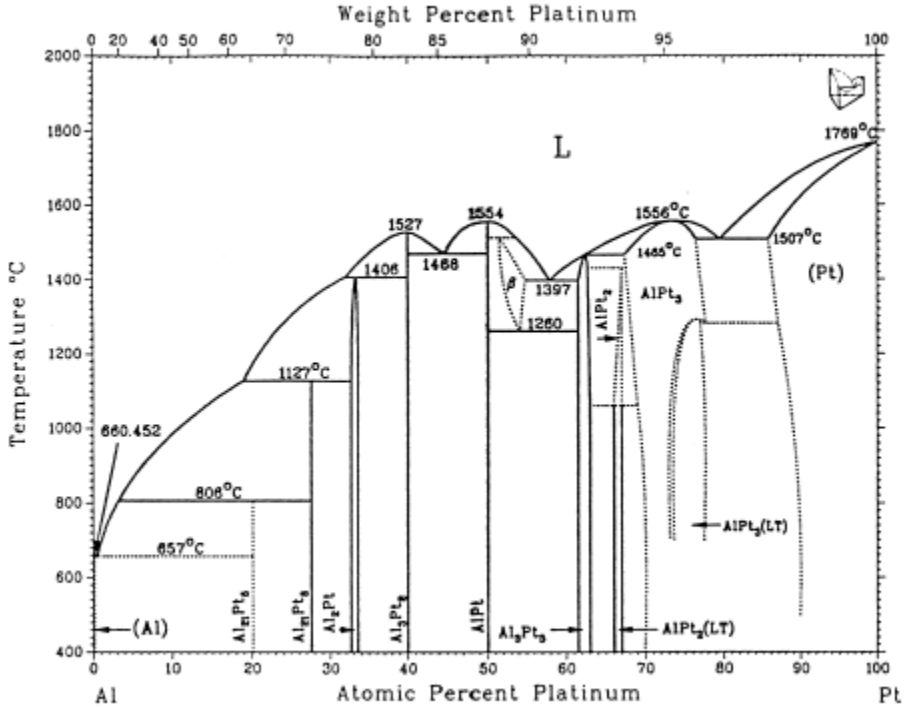
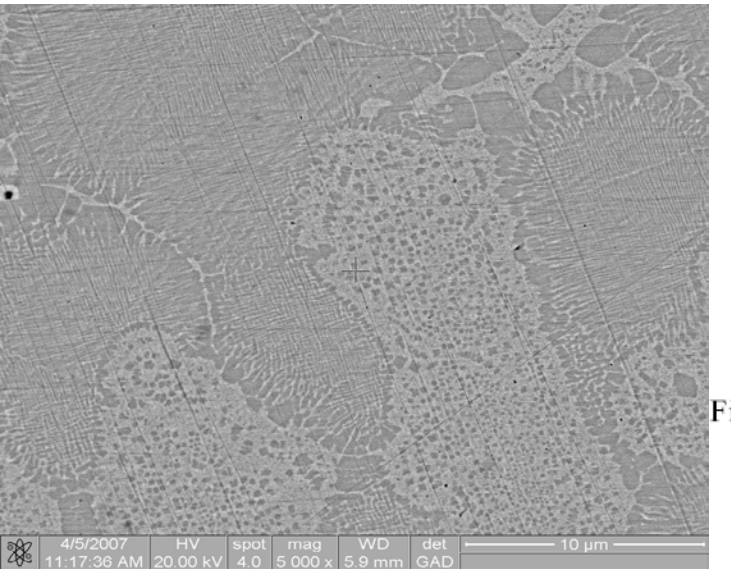


Fig. 1. Binary Pt–Al equilibrium phase diagram [11].

Sometimes, for small additions,
Can use a binary phase diagram
For higher ordered systems….

But be careful!

81.5 at.% Pt in the as-cast condition



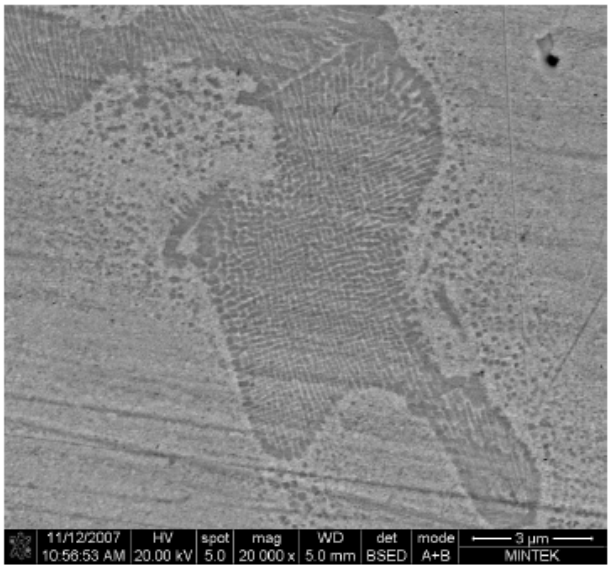
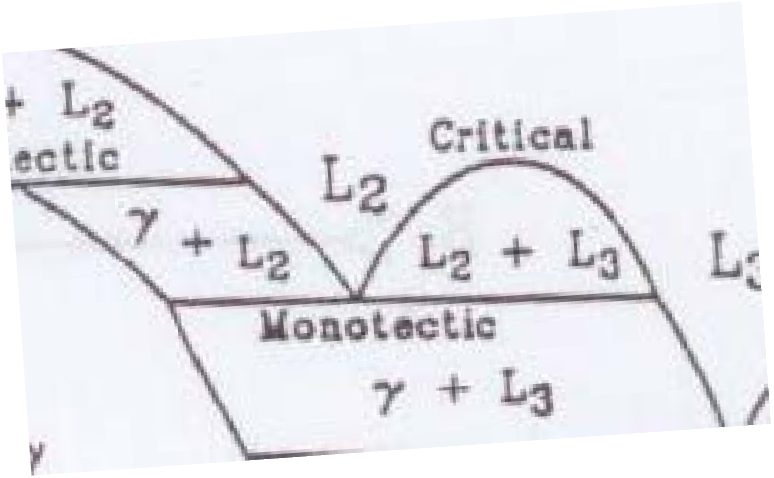


Figure 1. SEM-BSE image of nominal Pt_{82}:Al_{12}:Ru_2:Cr_4, showing the light (Pt) dendrites with darker ~Pt_3Al precipitates within, and the mainly dark eutectic/eutectoid of (Pt) + ~Pt_3Al.



Monotectic reaction

Figure 4.95 Microstructure of a slowly grown monotectic alloy, showing the tendency of the lead to assume the shape of droplets which settle on to the solid–liquid interface (x 100) (Courtesy of H. E. Cline[30])

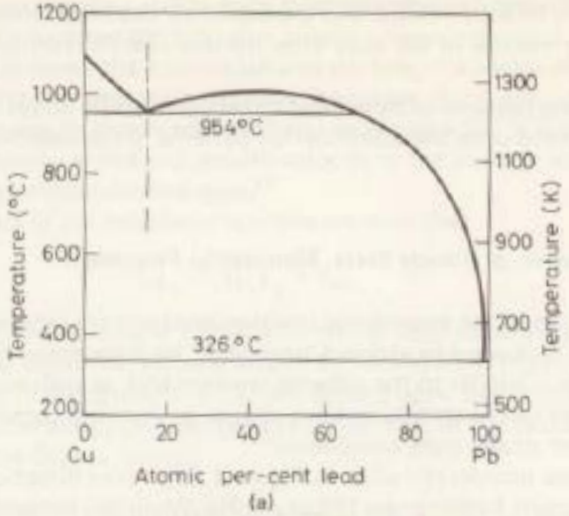
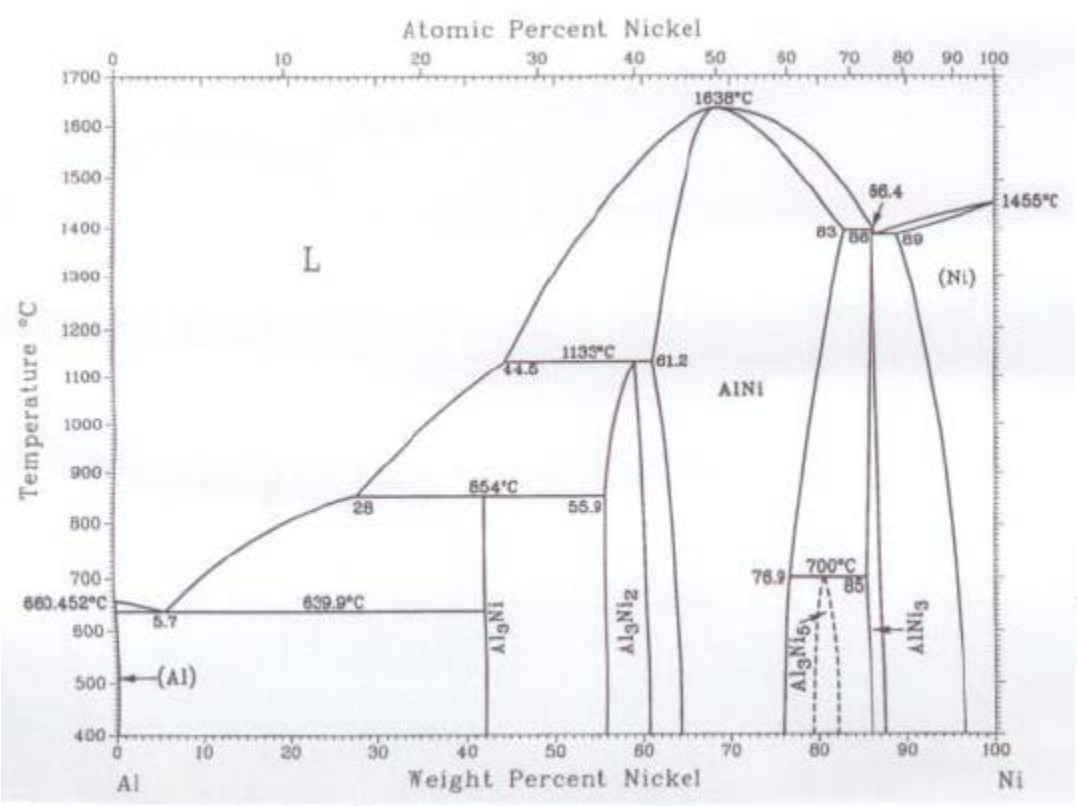
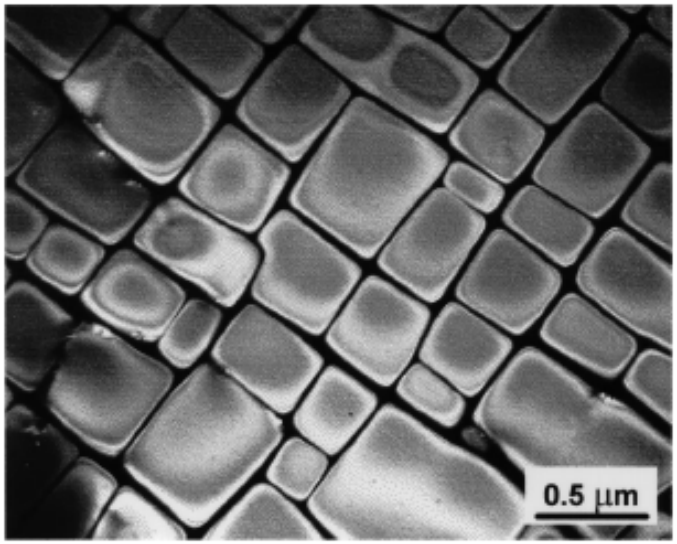
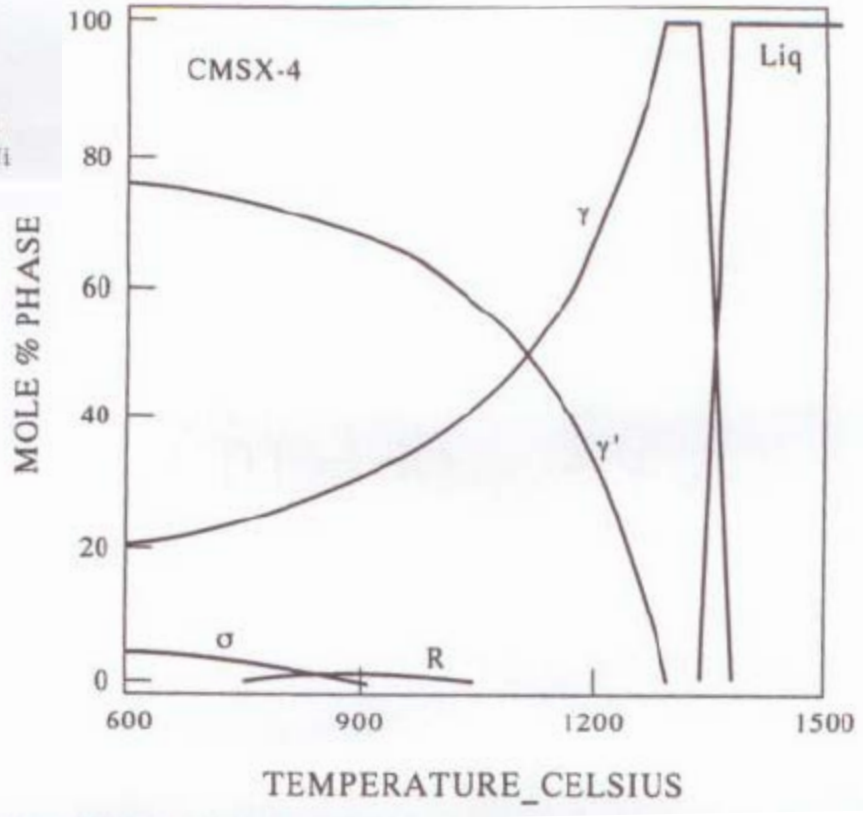


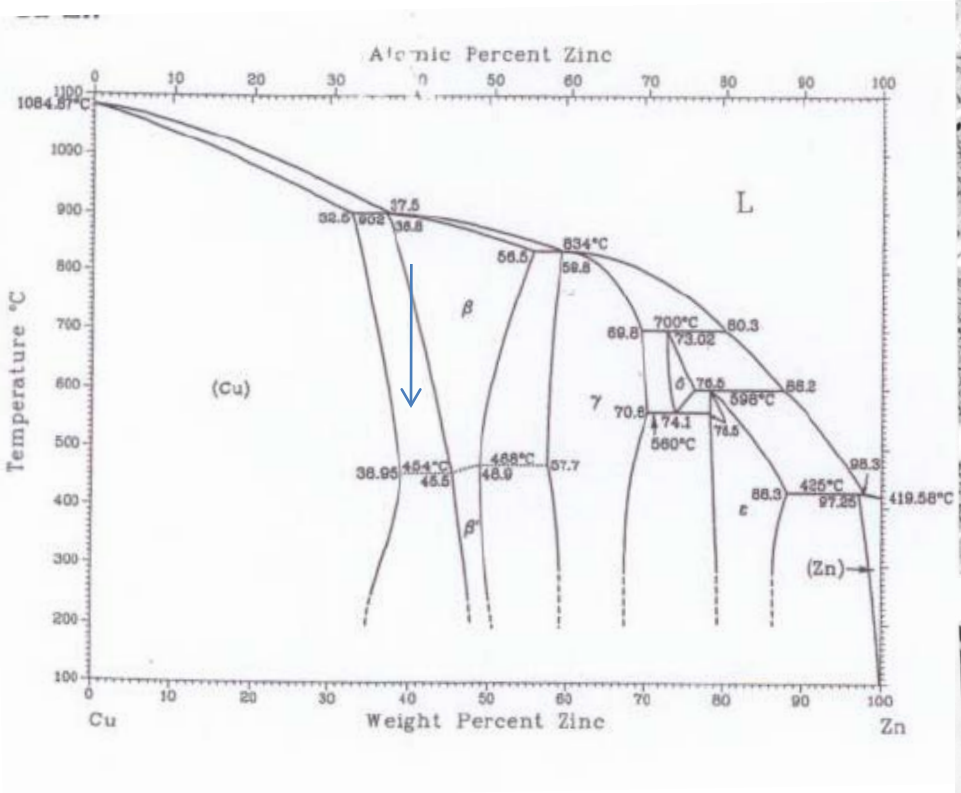
Figure 4.90 (a) Cu–Pb *equilibrium diagram. (b) As-cast microstructure of alloy of monotectic composition showing dendrites of copper in a lead matrix (x 50)*

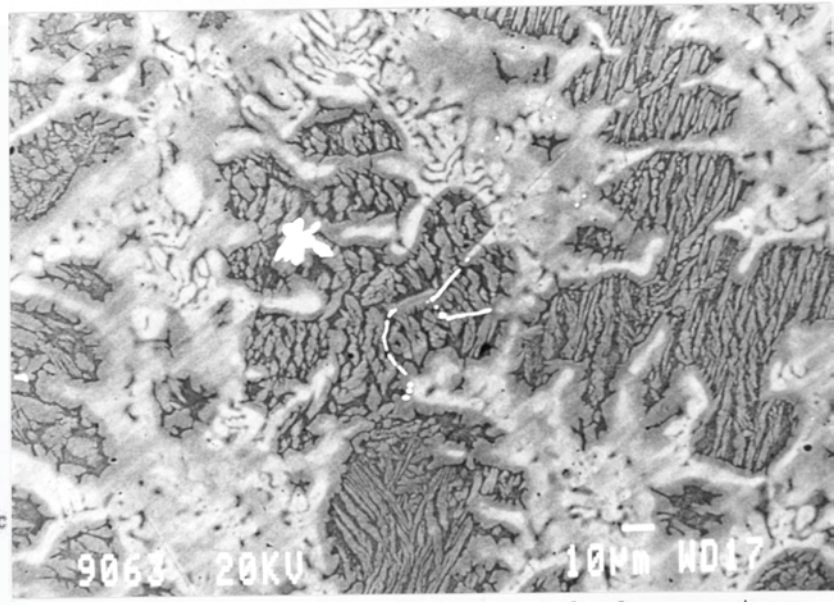

Atomic Percent Nickel
Temperature °C
Weight Percent Nickel
Al
Ni
L
1638°C
1455°C
66.4
83
88
89
(Ni)
1133°C
44.5
61.2
AlNi
654°C
28
55.9
660.452°C
639.9°C
5.7
(Al)
Al3Ni
Al3Ni2
700°C
76.9
85
Al3Ni5
AlNi3

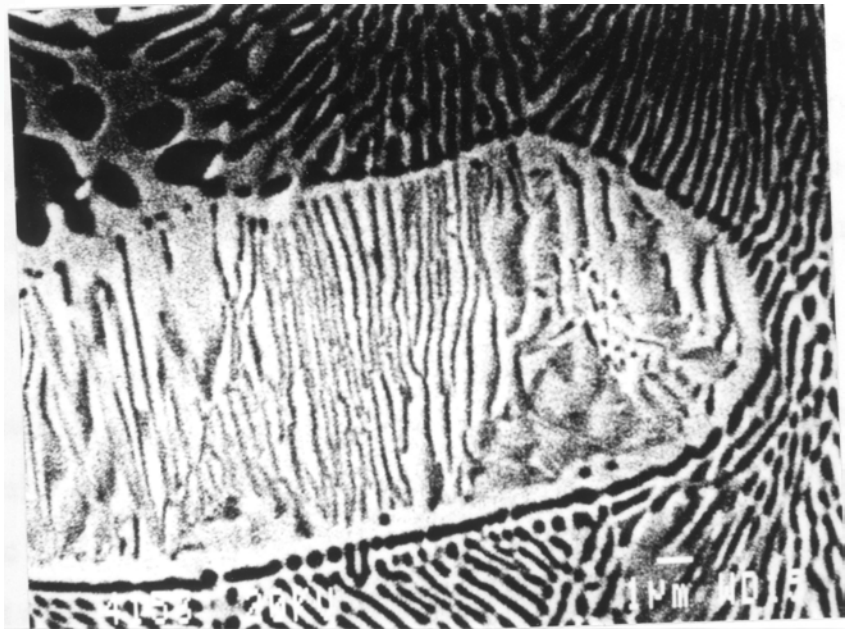

0.5 µm


CMSX-4
Liq
γ
γ'
σ
R
MOLE % PHASE
TEMPERATURE_CELSIUS

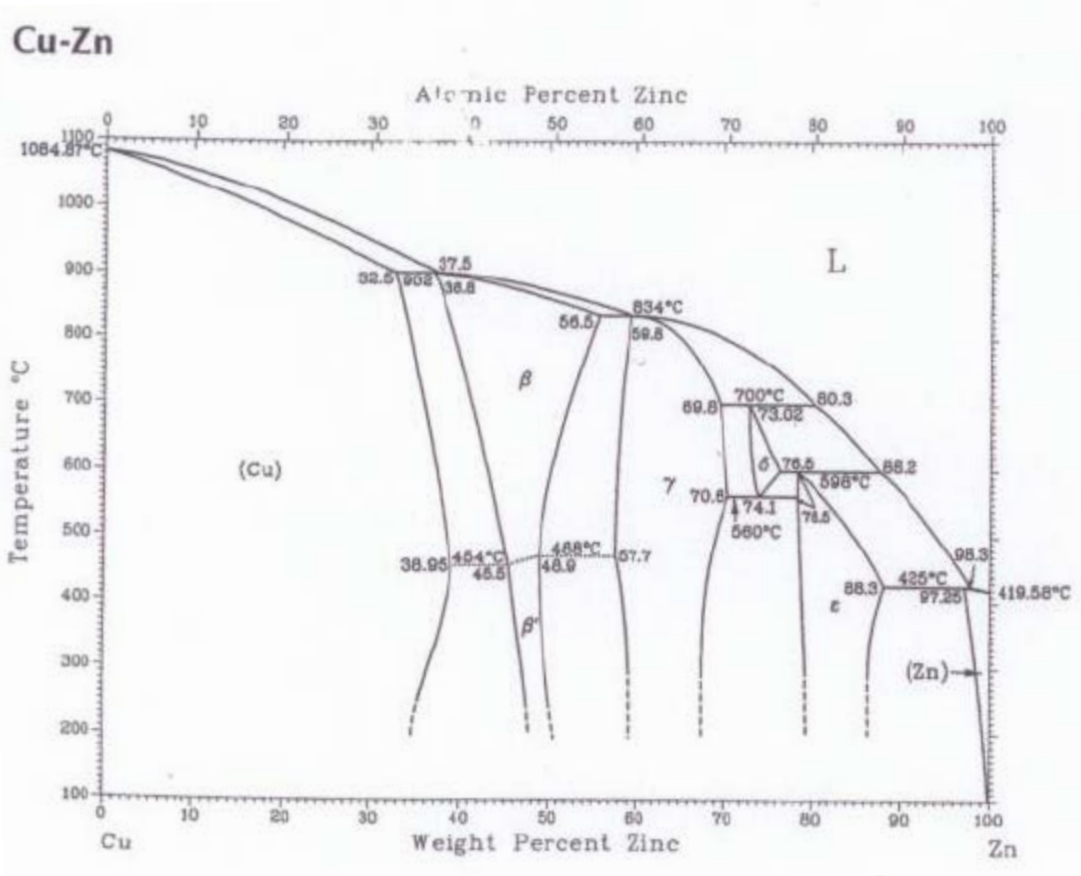
Solid state transformations (not reactions)







For example, although not this system….



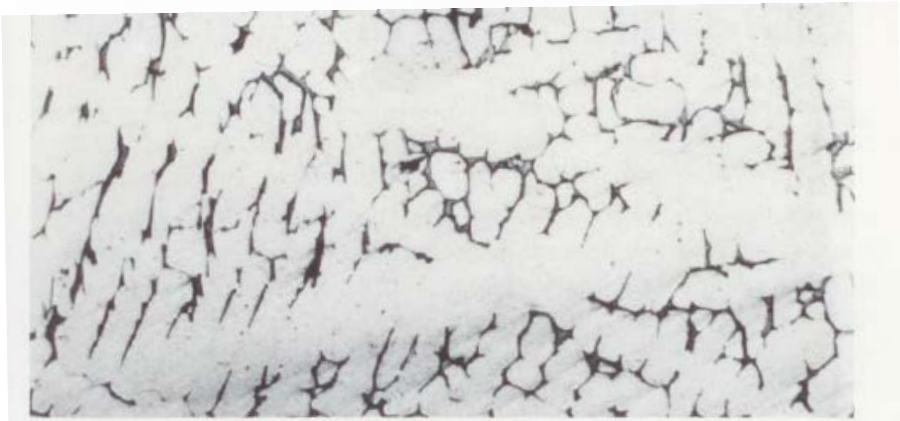
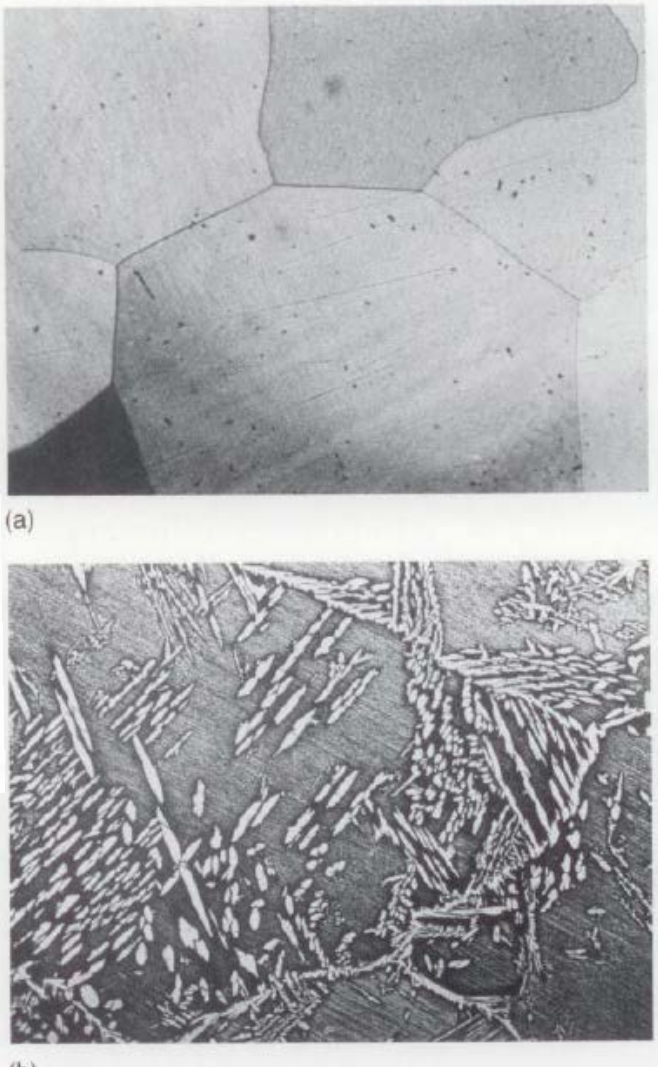


FIG. 5.41 Copper alloy with 37% Zn. With the solidification of the liquid α phase (bright background), a β phase is formed in a peritectic reaction between the remaining liquid and the α phase. 100×

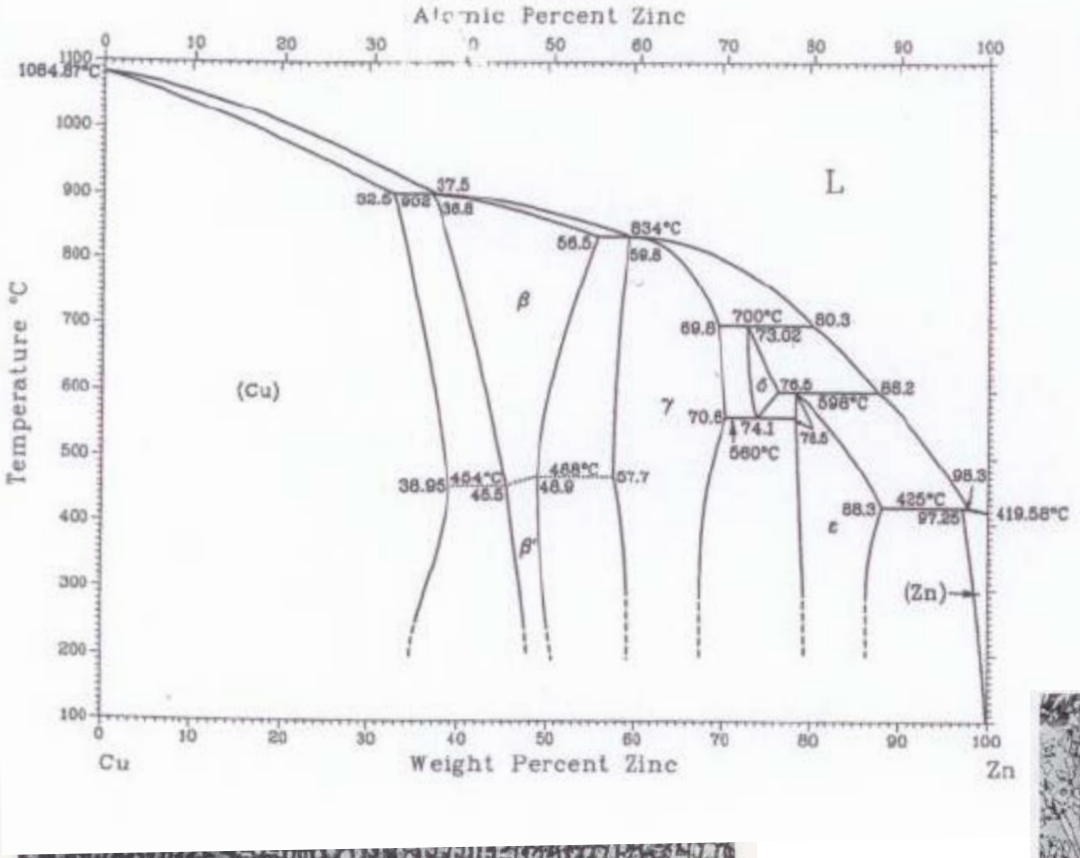


(a)

(b)

FIG. 6.35 Cu-42Zn alloy. (a) Following quenching from 800 °C (1470 °F) to room temperature. The result is a homogeneous structure of grains with equal axes of β phase, which tend to break up under heating and to exude α phase grains (75×). (b) Alpha phase grains on certain planes of β grains in the Widmanstätten structure. The change in orientation of the α grain precipitate is connected with the orientation of the β grains (75×).

Cu-Zn



)30 brass etched in alcoholic ferric chloride, showing cored grains, and interdendritic constituents. 100x.

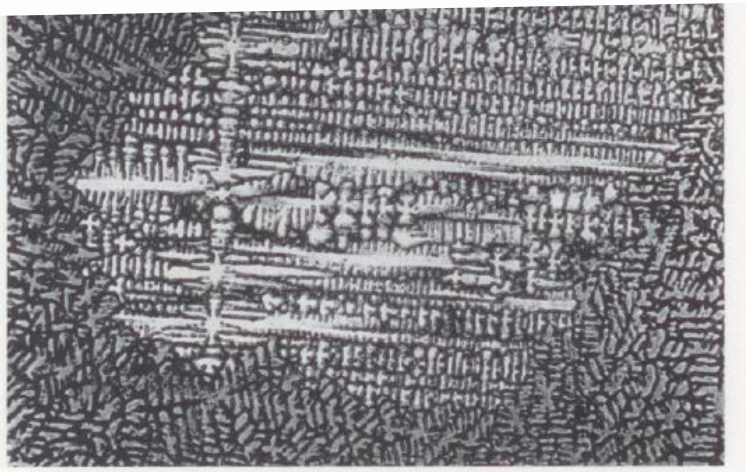
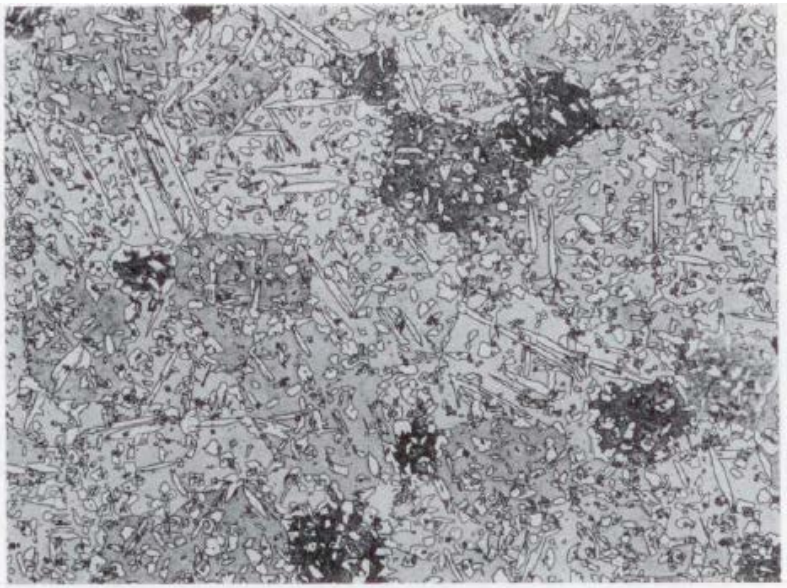
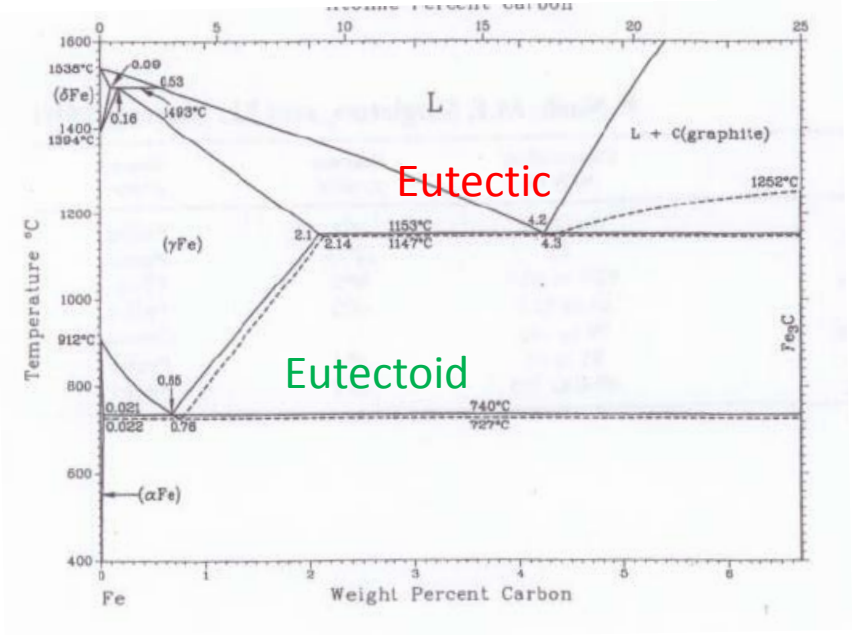


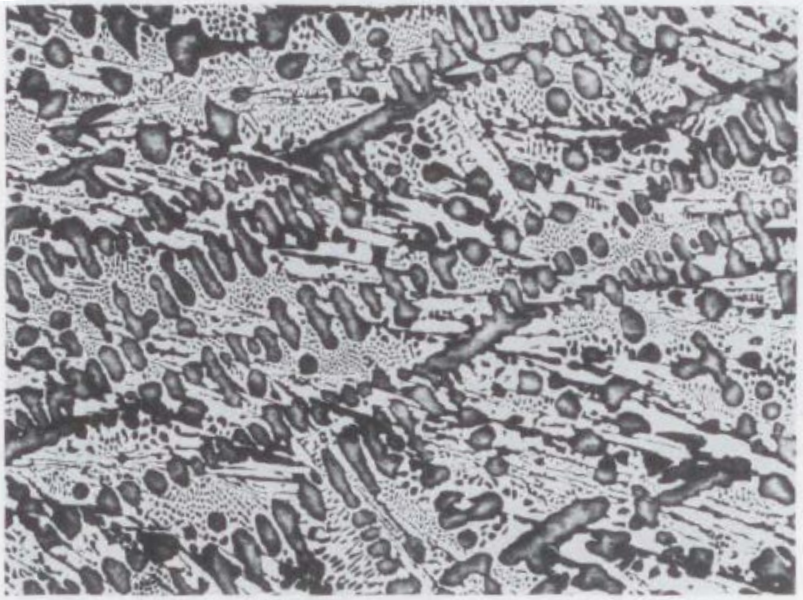
FIG. 5.4 65/35 brass with the addition of 1% Sn, cast in a metal mold. The tin prevents the formation of β phase. 100×



4. General view showing typical Widmanstätten structure in alloy after preparation under mechanical-chemical conditions. 100x.

Fe – C system





g. 119. *General view of hypo-eutectic white iron etched in picral; dendritic regions of pearlite and ledeburite eutectic. 100x.*

Fig. 121. Some pearlite in the ledeburite is resolved as well. 1000x.

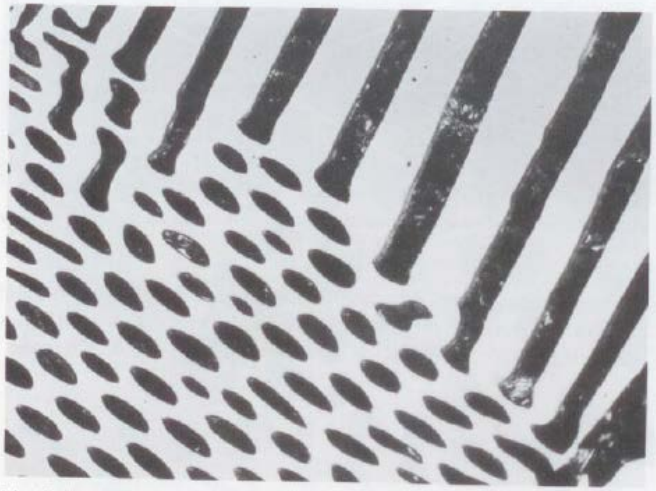


Fig. 124. Eutectic region at higher magnification revealing the rod like nature of the austenite constituent of the ledeburite eutectic. This austenite has transformed to pearlite which is partly resolved. 500x.

1	H	Hydrogen
2	He	Helium
3	Li	Lithium
4	Be	Beryllium
5	B	Boron
6	C	Carbon
7	N	Nitrogen
8	O	Oxygen
9	F	Fluorine
10	Ne	Neon
11	Na	Sodium
12	Mg	Magnesium
13	Al	Aluminium
14	Si	Silicon
15	P	Phosphorous
16	S	Sulphur
17	Cl	Chlorine
18	Ar	Argon
19	K	Potassium
20	Ca	Calcium
21	Sc	Scandium
22	Ti	Titanium
23	V	Vanadium
24	Cr	Chromium
25	Mn	Manganese
26	Fe	Iron

27	Co	Cobalt
28	Ni	Nickel
29	Cu	Copper
30	Zn	Zinc
31	Ga	Gallium
32	Ge	Germanium
33	As	Arsenic
34	Se	Selenium
35	Br	Bromine
36	Kr	Krypton
37	Rb	Rubidium
38	Sr	Strontium
39	Y	Yttrium
40	Zr	Zirconium
41	Nb	Niobium
42	Mo	Molybdenum
43	Tc	Technetium
44	Ru	Ruthenium
45	Rh	Rhodium
46	Pd	Palladium
47	Ag	Silver
48	Cd	Cadmium
49	In	Indium
50	Sn	Tin
51	Sb	Antimony
52	Te	Tellurium

53	I	Iodine
54	Xe	Xenon
55	Cs	Cesium
56	Ba	Barium
57	La	Lanthium
58	Ce	Cerium
59	Pr	Praseodymium
60	Nd	Neodymium
61	Pm	Promethium
62	Sm	Samarium
63	Eu	Europium
64	Gd	Gadolinium
65	Tb	Terbium
66	Dy	Dysprosium
67	Ho	Holmium
68	Er	Erbium
69	Tm	Thulium
70	Yb	Ytterbium
71	Lu	Lutetium
72	Hf	Hafnium
73	Ta	Tantalum
74	W	Tungsten
75	Re	Rhenium
76	Os	Osmium
77	Ir	Iridium
78	Pt	Platinum

79	Au	Gold
80	Hg	Mercury
81	Tl	Thallium
82	Pb	Lead
83	Bi	Bismuth
84	Po	Polonium
85	At	Astatine
86	Rn	Radon
87	Fr	Francium
88	Ra	Radium
89	Ac	Actinum
90	Th	Thorium
91	Pa	Protactinium
92	U	Uranium
93	Np	Neptunium
94	Pu	Plutonium
95	Am	Americium
96	Cm	Curium
97	Bk	Berkelium
98	Cf	Californium
99	Es	Einsteinium
100	Fm	Fermium
101	Md	Mendelevium
102	No	Nobelium
103	Lr	Lawrencium

3.4. Sequential Order of the Elements

For system names: alphabetical order of element symbols

For compound names: chemical order according to

D.G. ~~G.D.~~ Pettifor, *J. Phys. C*, **19**, 285-313 (1986)

For diagrams: chemical order - left side (element with lower Petifor number); right side (element with higher Petifor number)

Examples: HfC_{1-x} in the C–Hf system, or YLa_3 in the Al–Y system

Ac 48	Be 77	Cm41	Fe 61	Ho 23	Md 36	No 35	Pr 31	Sb 88	Te 92	Yb 17
Ag 71	Bi 87	Co 64	Fm37	I 97	Mg 73	Np 44	Pt 68	Sc 19	Th 47	Zn 76
Al 80	Bk 40	Cr 57	Fr 7	In 79	Mn 60	O 101	Pu 43	Se 93	Ti 51	Zr 49
Am42	Br 98	Cs 8	Ga 81	Ir 66	Mo 56	Os 63	Ra 13	Si 85	Tl 78	
Ar 3	C 95	Cu 72	Gd 27	K 10	N 100	P 90	Rb 9	Sm 28	Tm 21	
As 89	Ca 16	Dy 24	Ge 84	Kr 4	Na 11	Pa 46	Re 58	Sn 83	U 45	
At 96	Cd 75	Er 22	H 103	La 33	Nb 53	Pb 82	Rh 65	Sr 15	V 54	
Au 70	Ce 32	Es 38	He 1	Li 12	Nd 30	Pd 69	Rn 6	Ta 52	W 55	
B 86	Cf 39	Eu 18	Hf 50	Lr 34	Ne 2	Pm29	Ru 62	Tb 26	Xe 5	
Ba 14	Cl 99	F 102	Hg 74	Lu 20	Ni67	Po 91	S 94	Tc 59	Y 25	