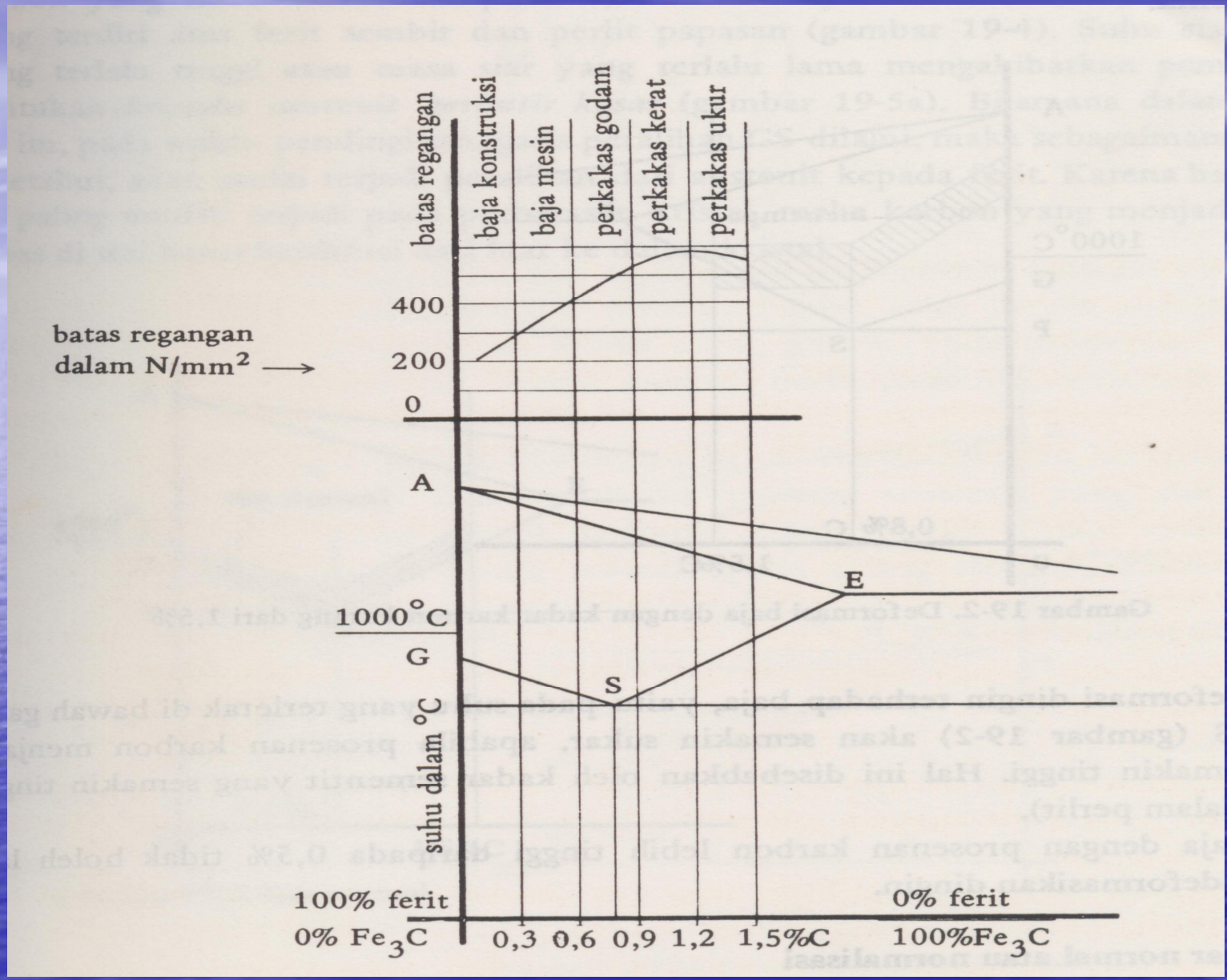
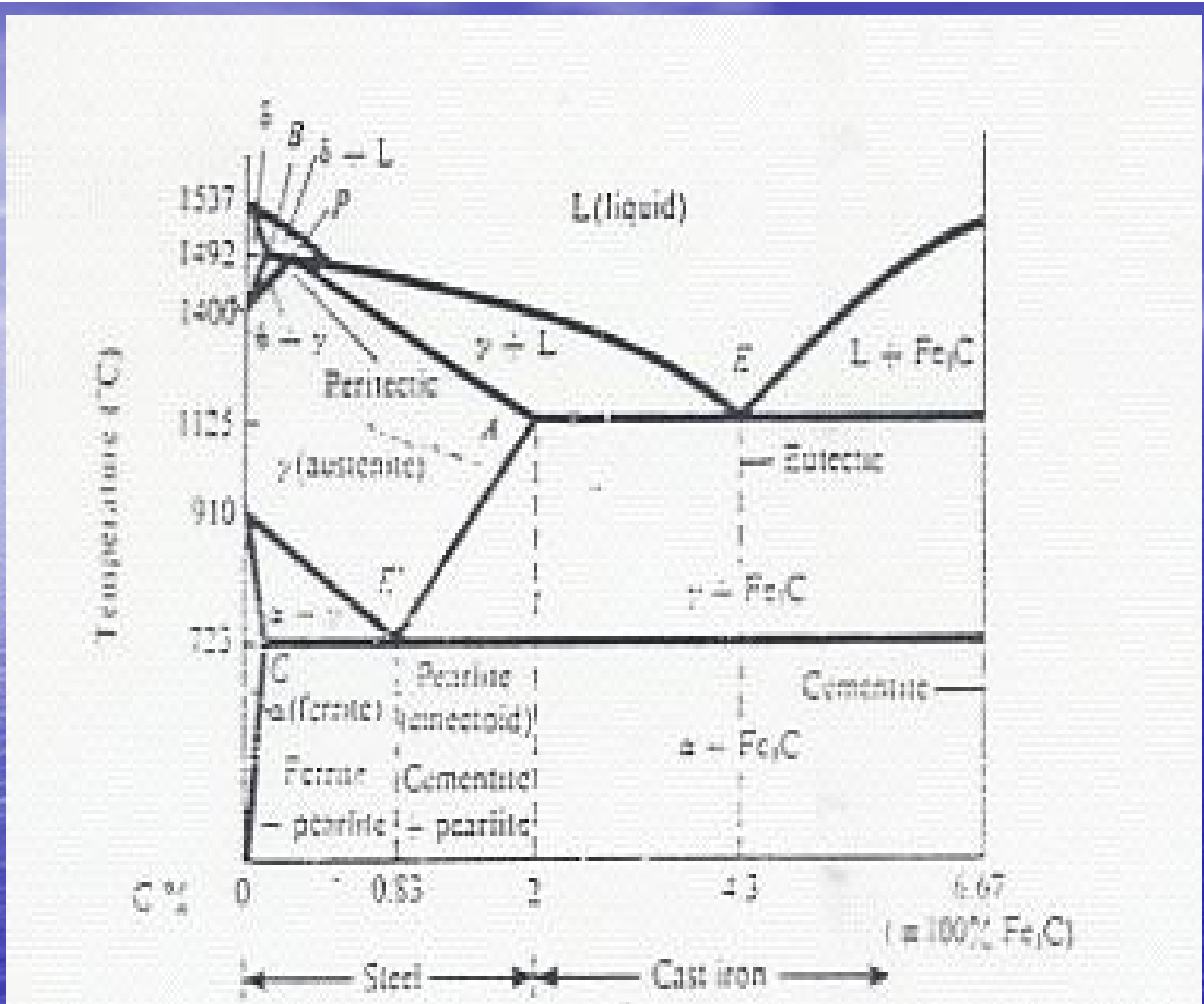
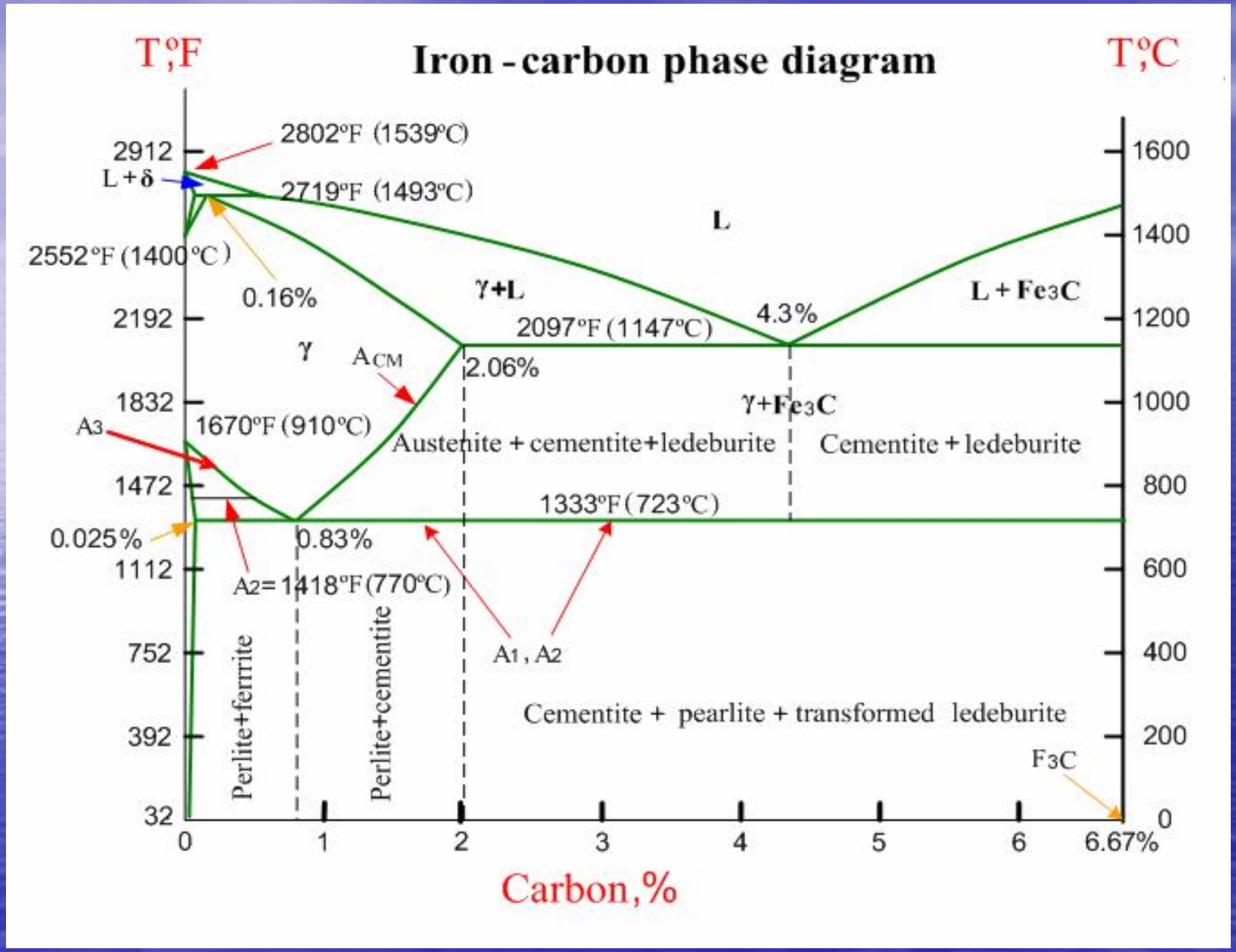
METALURGI FISIK

Diagram Fe – Fe_3C


batas regangan
baja konstruksi
baja mesin
perkakas godam
perkakas kerat
perkakas ukur
batas regangan dalam N/mm²
400
200
0
A
E
1000°C
G
S
suhu dalam °C
100% ferit
0% Fe3C
0,3 0,6 0,9 1,2 1,5%C
0% ferit
100%Fe3C

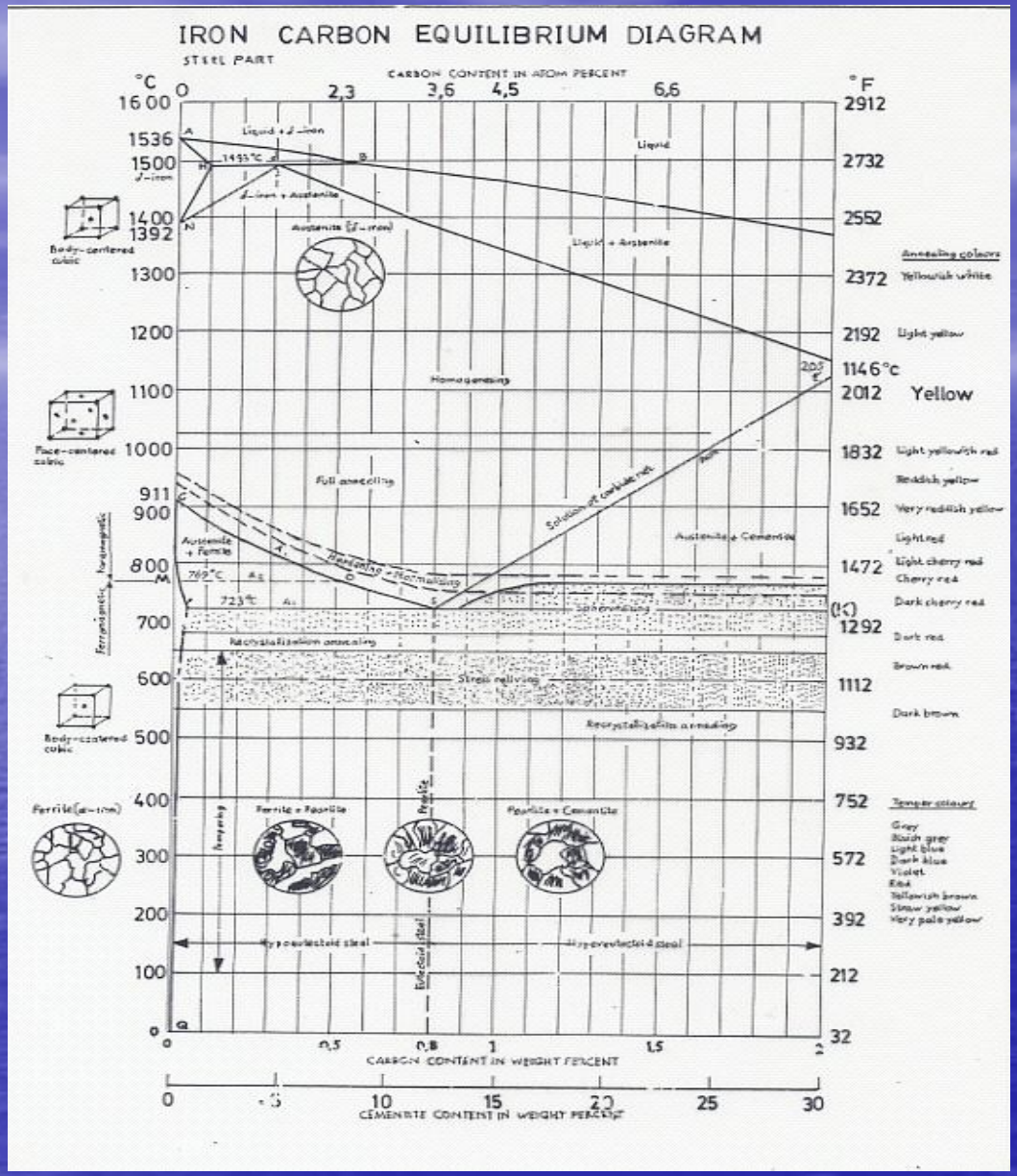


Gambar : Diagram Fe – Fe_3C

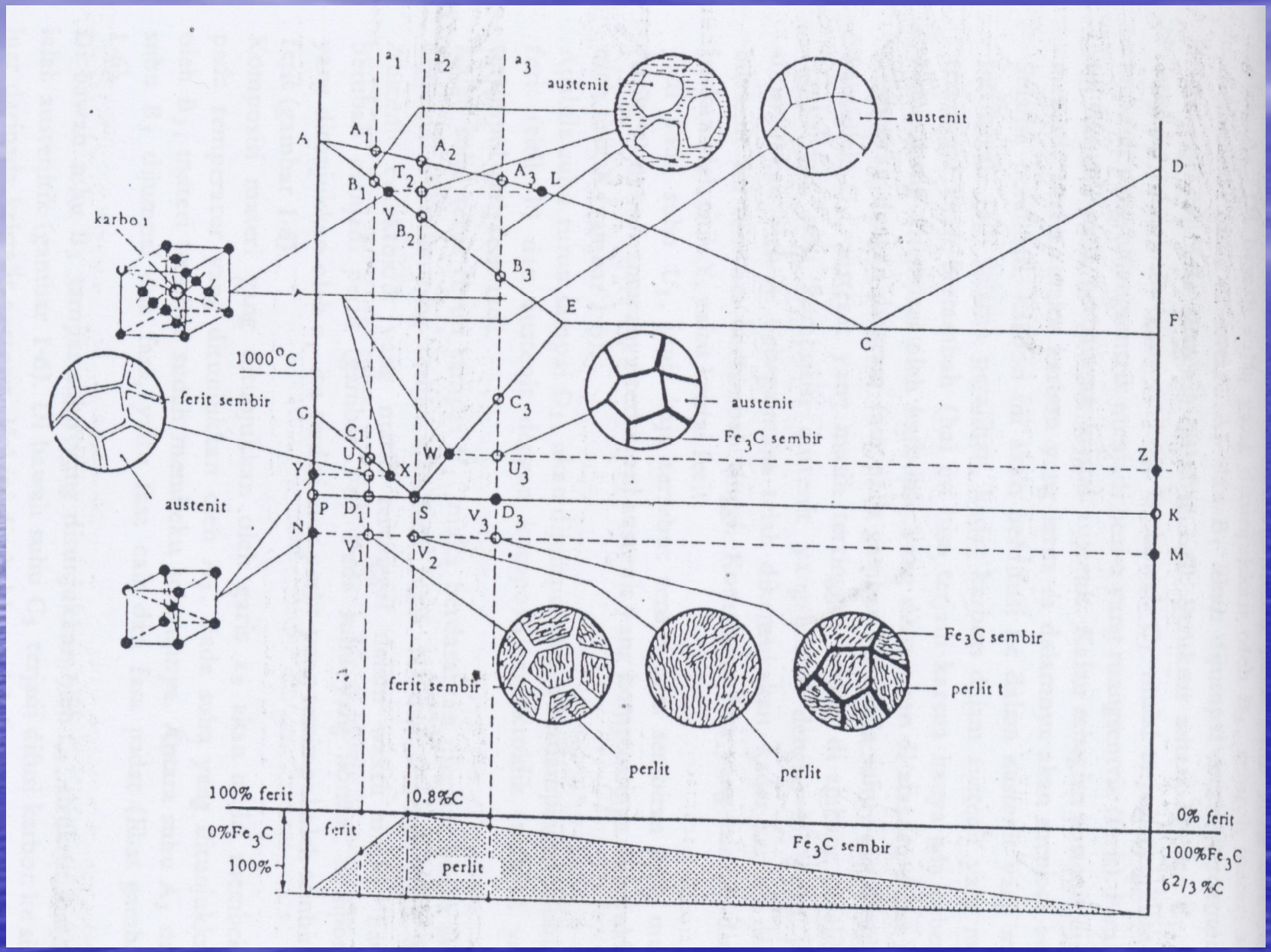

T,°F
Iron - carbon phase diagram
T,°C
2912
1600
2802°F (1539°C)
L + δ
2719°F (1493°C)
L
1400
2552°F (1400°C)
0.16%
γ+L
L + Fe3C
2192
1200
4.3%
2097°F (1147°C)
γ
ACM
2.06%
1832
1000
γ+Fe3C
A3
1670°F (910°C)
Austenite + cementite+ledeburite
Cementite + ledeburite
1472
800
1333°F (723°C)
0.025%
0.83%
1112
600
A2= 1418°F (770°C)
752
400
A1 , A2
Perlite+ferrrite
Perlite+cementite
Cementite + pearlite + transformed ledeburite
392
200
F3C
32
0
0
1
2
3
4
5
6
6.67%
Carbon,%

Fasa Besi & Baja

1. Ferrit (Fe α)
2. Austenit (Fe γ)
3. Sementit (Fe_3C)
4. Perlit (Fe α + Fe_3C)
5. Ledeburit (Fe γ + Fe_3C)
6. Grafit (carbon bebas)

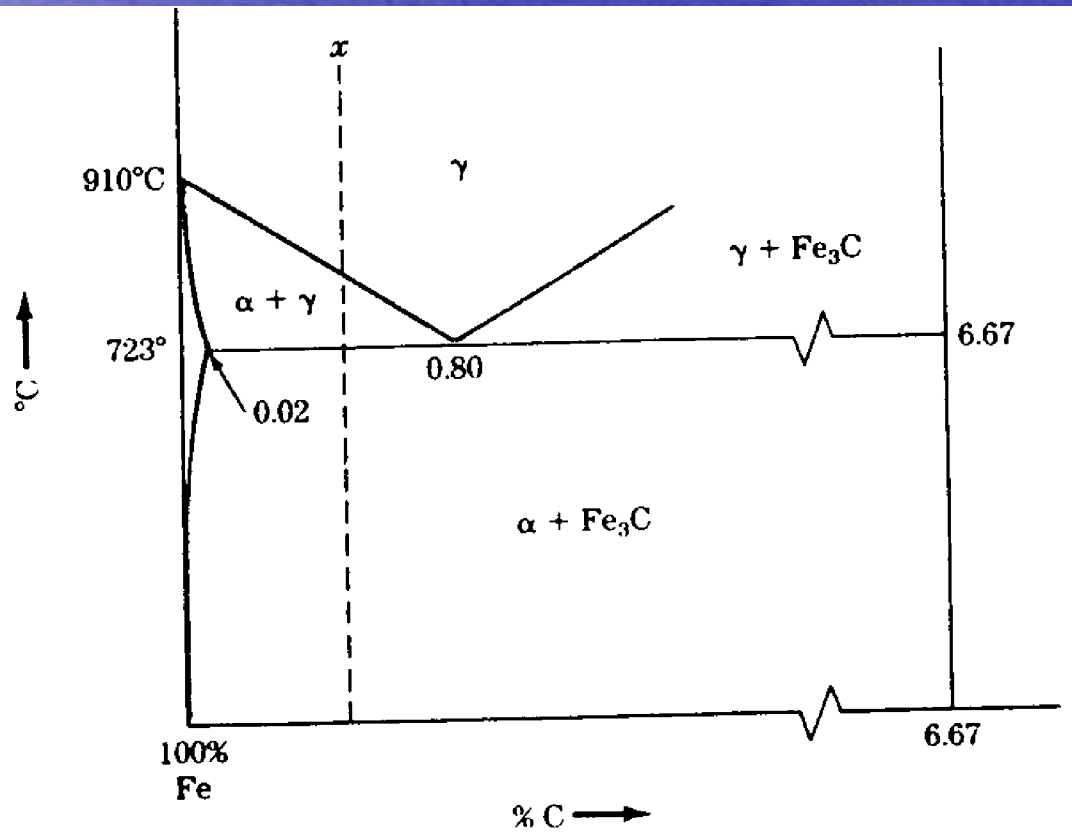


Gambar : Diagram Besi – Besi Karbida


a1
a2
a3
austenit
austenit
A
A1
A2
A3
L
T2
B1
V
B2
B3
D
karbon
E
F
C
1000°C
ferit sembir
austenit
Fe3C sembir
G
C1
C3
U1
W
Z
Y
X
U3
P
D1
S
V3
D3
K
N
V1
V2
M
Fe3C sembir
ferit sembir
perlit t
perlit
perlit
100% ferit
0.8%C
0% ferit
0%Fe3C
ferit
Fe3C sembir
100%Fe3C
100%
perlit
6 2/3 %C

Hypoeutectoid Phase Diagram

- If a steel with a composition *x*% carbon is cooled from the Austenite region at about 770 °C ferrite begins to form. This is called *pro*eutectoid (or *pre*-eutectoid) ferrite since it forms before the eutectoid temperature.



TYPE OF IRON

- α–Iron (Ferrite) Stable up to 912 ^{o}C.
- BCC in Structure. Soft in pure state.
- Can disolve up to .02% Carbon.

- γ–Iron (Austenite) Stable between 912 ^{o}C and 1394 ^{o}C.
- FCC in Structure

- Cementite (Iron Carbide) Fe_3C Hard and Brittle
- Complex Structure.

TYPE OF STEEL

- Hypo-Eutectoid Steel: % of Carbon < 0.8
- Eutectoid Steel: % of Carbon = 0.8
- Hyper-Eutectoid Steel: % of Carbon > 0.8

LOWER CRITICAL TEMPERATURE

When steel heated, microstructure changes (new grains forms). The temperature where this growth starts is called Lower Critical Temperature, fix for all % of C, 727^{o}C

UPPER CRITICAL TEMPERATURE

- The temperature where new grains formation completes, (All old grains replaced by new grains) is called Upper critical temperature.
- This temperature depends upon % of Carbon in steel.
- Can be taken from Iron-Carbon Diagram .

IRON-CARBON DIAGRAM