

Solution 7

11-8

Solution:

(a) $\beta \beta' \gamma \delta \varepsilon$:

(b) α, θ

(c) $900^\circ\text{C}: \alpha + L \rightarrow \beta$; peritectic

830 °C: $\beta + L \rightarrow \gamma$; peritectic

700 °C: $\gamma + L \rightarrow \delta$; peritectic

600 °C: $\delta + L \rightarrow \varepsilon$; peritectic

550 °C: $\delta \rightarrow \gamma + \varepsilon$; eutectoid

420 °C: $\varepsilon + L \rightarrow \theta$; peritectic

250:°C: $\beta' \rightarrow \alpha + \gamma$;eutectoid

11-14

(a) hypoeutectic

(b) 14% Sn

(c) α :19% Sn L: 61.9% Sn $\% \alpha = \frac{61.9 - 35}{61.9 - 19} \times 100\% = 63\%$ $\% L = 37\%$

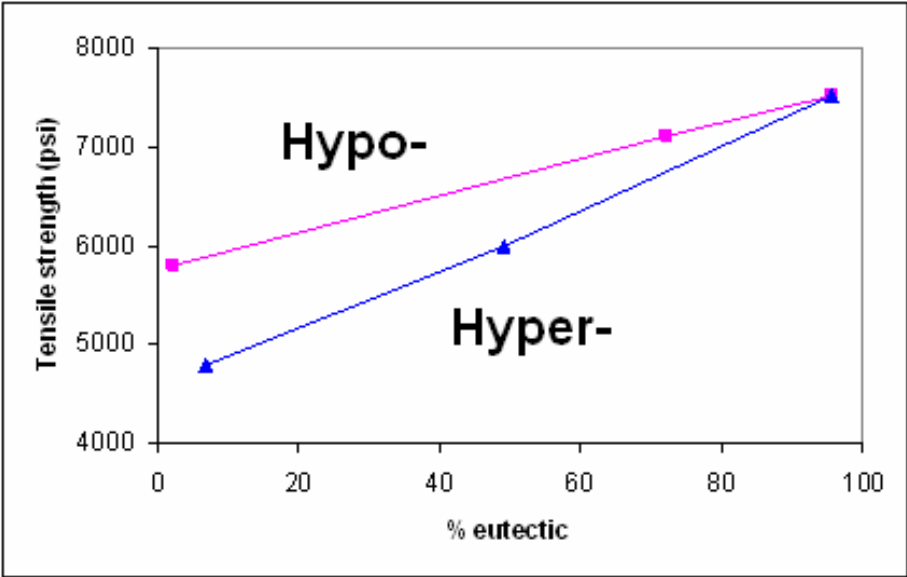
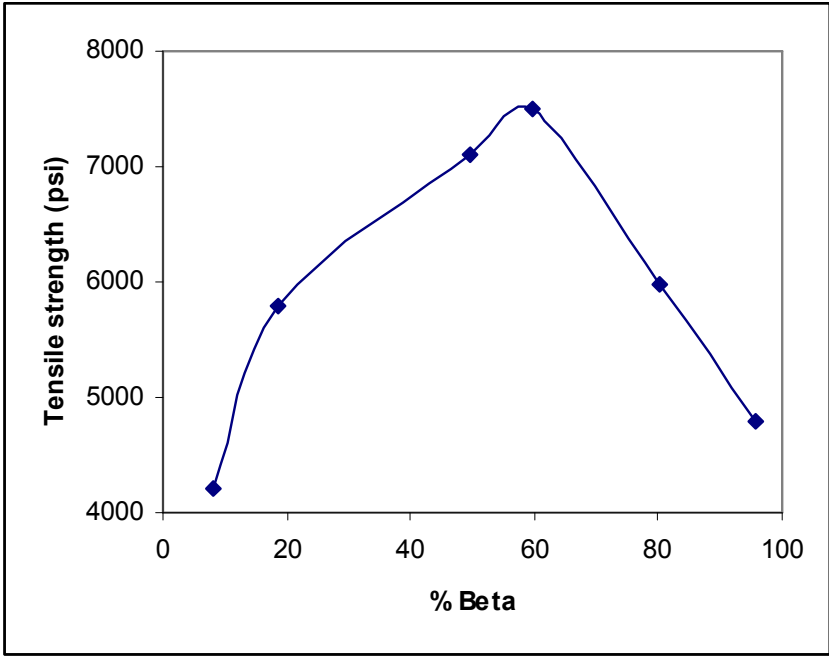
(d) α :19% Sn β : 97.5% Sn $\% \alpha = \frac{97.5 - 35}{97.5 - 19} \times 100\% = 80\%$ $\% \beta = 20\%$

(e) primary α :19% Sn $\% \text{primary } \alpha = 63\%$, eutectic:61.9% Sn, $\% \text{ eutectic} = 37\%$

(f) α :2% Sn β : 100% Sn $\% \alpha = \frac{100 - 35}{100 - 2} \times 100\% = 66\%$ $\% \beta = 34\%$

11-16

| | $\% \beta$ | $\% \text{eutectic}$ |
|--------|----------------------------------|--|
| 10%Sn | $\frac{10 - 2}{99 - 2} = 8.2\%$ | 0% |
| 20%Sn | $\frac{20 - 2}{99 - 2} = 18.6\%$ | $\frac{20 - 19}{61.9 - 19} = 2.3\%$ |
| 50% Sn | $\frac{50 - 2}{99 - 2} = 49.5\%$ | $\frac{50 - 19}{61.9 - 19} = 72.3\%$ |
| 60% Sn | $\frac{60 - 2}{99 - 2} = 59.8\%$ | $\frac{60 - 19}{61.9 - 19} = 95.6\%$ |
| 80% Sn | $\frac{80 - 2}{99 - 2} = 80.4\%$ | $\frac{97.5 - 80}{97.5 - 61.9} = 49.2\%$ |
| 95% Sn | $\frac{95 - 2}{99 - 2} = 95.9\%$ | $\frac{97.5 - 95}{97.5 - 61.9} = 7\%$ |



11-18

(a) hypereutectic

(b) 100% Si

(c) β : 99.83% Si L: 12.6% Si

$$\%L = \frac{99.83 - 25}{99.83 - 12.6} = 85.8\% \quad \% \beta = 14.2\%$$

(d) α : 1.65% Si: β : 99.83% Si

$$\% \alpha = \frac{99.83 - 25}{99.83 - 1.65} = 76.2\% \quad \% \beta = 23.8\%$$

(e) primary β : 99.83% Si
eutectic: 12.6% Si

primary β : 14.2%
eutectic: 85.8%

(f) α : 0% Si β : 100% Si

$$\% \alpha = \frac{100 - 25}{99.83 - 0} = 75\% \quad \% \beta = 25\%$$