HW 8 Solution

12-8

(a)

Al-4%Mg	Al-6%Mg	Al-12%Mg
Treat at 210-451°C	Treat at 280-451°C	Treat at 390-451 °C
Age at <210°C(quench)	Age at <280°C(quench)	Age at < 390°C(quench)

(b)Answer will vary depending on aging temperature selected. If all three are aged at 200C, as example, the tie line goes from about 3.8to 35%Mg:

Al-4% Mg: $\%\beta = \frac{4-3.8}{35-3.8}\times 100 = 0.6\%$

Al-6% Mg: $\%\beta = \frac{6-3.8}{35-3.8}\times 100 = 7.1\%$

Al-12% Mg: $\%\beta = \frac{12-3.8}{35-3.8}\times 100 = 26.8\%$

(c) Most likely, a coherent precipitate is not formed; simple dispersion strengthening, rather than age hardening, occurs.

12-9

wt% $\alpha = \frac{53-2.5}{51-1}\times 100 = 97.12\%$ **, wt%** $\theta = 2.88\%$

Vol fraction $\theta = \frac{\frac{2.88\text{g}}{4.26\text{g/cm}^3}}{\frac{2.88}{4.26}+\frac{97.12}{2.669}} = 0.0182\text{cm}^3$ **θ/cm^3 alloy**

$d_\theta = 9000\times 10^{-9}\,\text{m} = 9\times 10^{-4}\,\text{cm}$ r_θ **=4.5×10^{-4}cm**

V$_θ$= $\frac{4\pi}{3}(4.5\times 10^{-4}\,\text{cm})^3 = 382\times 10^{-12}\,\text{cm}^3$

# of particles = $\frac{0.0182\text{cm}^3}{382\times 10^{-12}\,\text{cm}^3} = 4.76\times 10^{10}$ **particles**

12-31

Pearlite = 0.94= $\dfrac{6.67 - x}{6.67 - 0.77}$ **x=1.124%C: Hypereutectid**

12-56

(a) $\gamma = 0.77\%C$ $\%M = \dfrac{6.67 - 0.95}{6.67 - 0.77} \times 100 = 96.9\%$

(b) $\gamma = 0.82\%C$ $\%M = \dfrac{6.67 - 0.95}{6.67 - 0.82} \times 100 = 97.8\%$

(c) $\gamma = 0.88\%C$ $\%M = \dfrac{6.67 - 0.95}{6.67 - 0.88} \times 100 = 98.8\%$

(d) $\gamma = 0.95\%C$ **%M=100%**