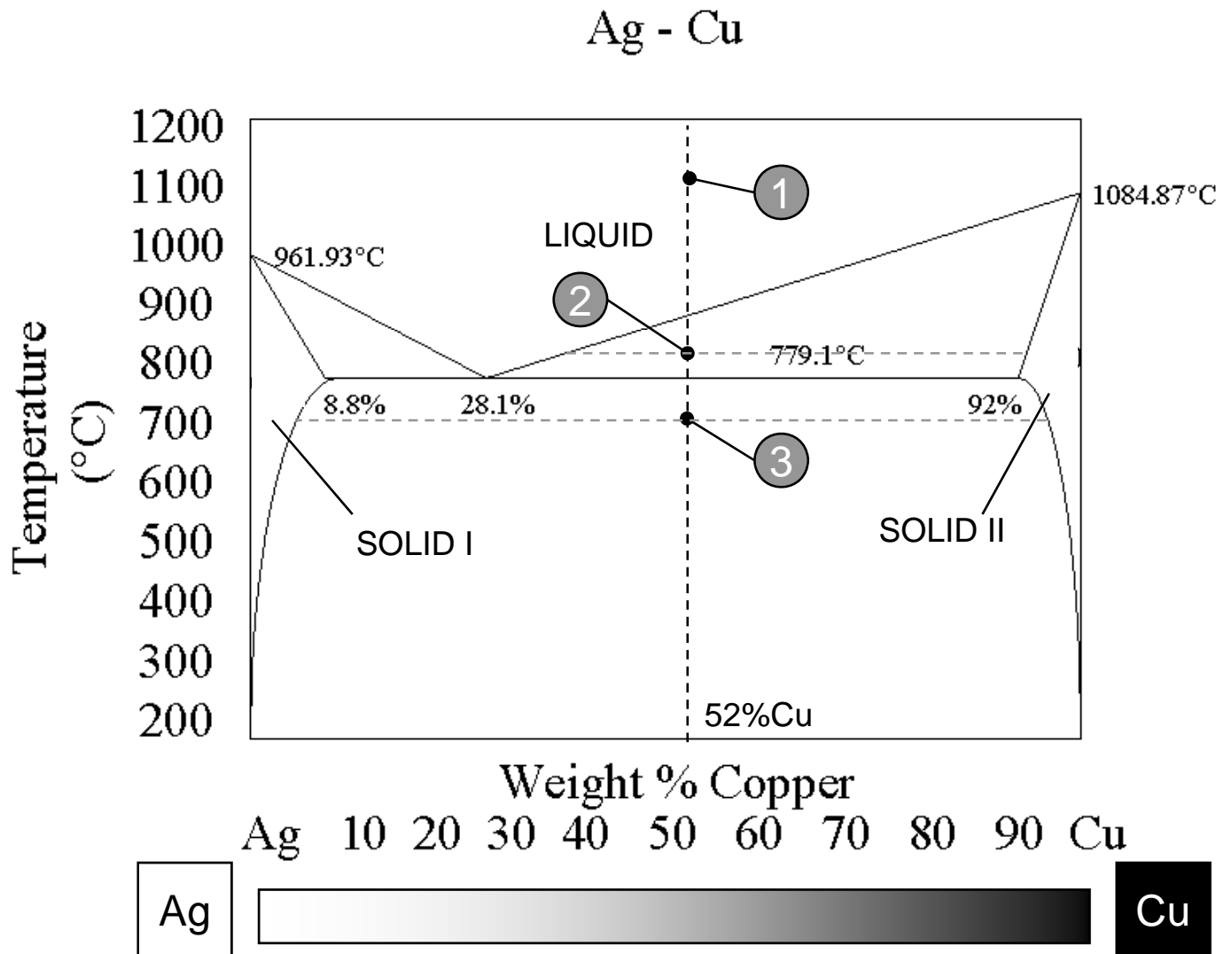
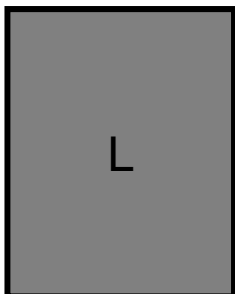


ENGG 201 – Chapter 4 – Liquid/Solid System Example

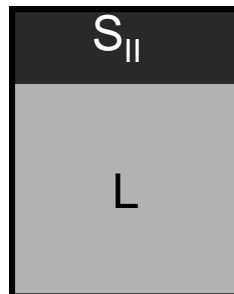


1



100% LIQUID (52%Cu)

2



75% LIQUID (38%Cu)
25% SOLID_{II} (94%Cu)

3



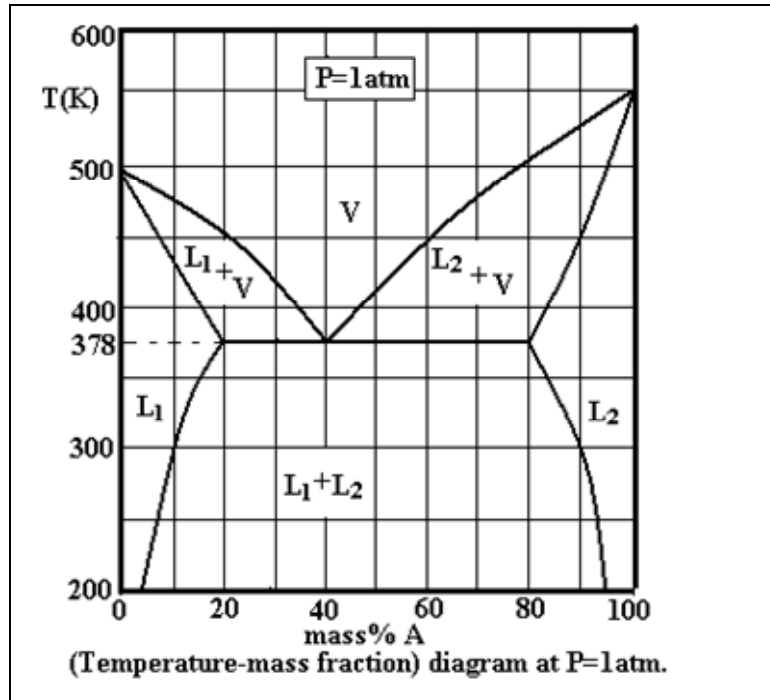
48.3% SOLID_I (5%Cu)
51.6% SOLID_{II} (96%Cu)

ENGG 201 – Chapter 4 – Vapor/Liquid System Example

Fall 2000 (Final)

Consider the liquid-vapour phase diagram for two components A and B, shown in the figure.

The molar masses of A and B are:
 $M_A = 45 \text{ kg/kmol}$,
 $M_B = 40 \text{ kg/kmol}$.



- (a) Determine the normal boiling points of A and B.
- (b) Label on the diagram all the phase regions.
- (c) Consider a mixture consisting of 70wt% of A. The mixture has a mass of 3kg and is held at a temperature $T=450\text{K}$.
 - (i) What are the phases present and their compositions?
 - (ii) What is the mass of each of the phases you reported in question (i)?
- (d) Consider a new mixture, which is 90wt% A and 10wt% B. The total number of moles in the mixture is equal to 22.5 moles.
 - (i) What is the mass of this mixture?
 - (ii) What are the masses of A and B in the mixture?
 - (iii) What is the boiling temperature of this mixture?
 - (iv) Determine the composition of the first bubble that forms at the boiling temperature of the mixture.
 - (v) The mixture is held at a fixed temperature equal to its boiling temperature, and B is gradually added until all the mixture has become vapour. Determine the mass of B added.
 - (vi) The resulting mixture is cooled down to a temperature $T=378\text{K}$. Determine the phases present at this temperature and their compositions.

Ans. (a) $T_A=550\text{K}$, $T_B=500\text{K}$,
 (b) See diagram,
 (c) (i) V(60%), L_2 (90%), (ii) V(2kg), L_2 (1kg),
 (d) (i) 1kg, (ii) 0.9kg, 0.1kg, (iii) 450K, (iv) 60%,
 (v) 0.5kg, (vi) L_1 (20%), L_2 (80%), V(40%).