Lecture 25 Ternary diagram

Question:

1. Sketch a composition triangle to represent composition of a ternary alloy and locate the alloys having following compositions (a) 20A 40B 40C (b) 60A20B20C

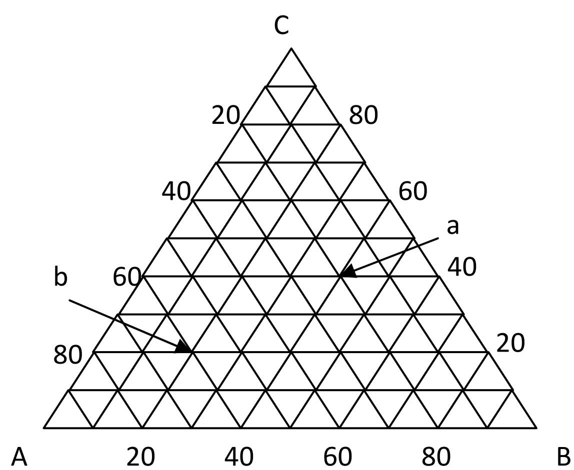
2. In a ternary system estimate amount of α & β in an alloy having 22.5%A, 23.5%B, 50%C at a given temperature T where three phases a, b and liquid are in equilibrium. Composition of these three phases are liquid: 15A 15B70C, α: 60A20B20C, β:20A40B20C

3. Find out the composition of the alloy which has 50% α & 50% β at temperature T for sytem described in problem 2.

4. A ternary system consisting of three metals A, B & C has two binary eutectics; one between A & B and the other between B & C and one binary isomorphous system between A & C. The system has two terminal solid solutions (α and β). Assume that the temperature of binary eutectic between A & B is higher than that of B & C. (a) Sketch a space model of this system indicating single phase, two phase and three phase regions. (b) Sketch an isothermal section at a temperature where there are single phase, two phase and three phase regions. (c) Sketch a vertical section passing through B and the midpoint between A & C of the composition triangle.

Answer:

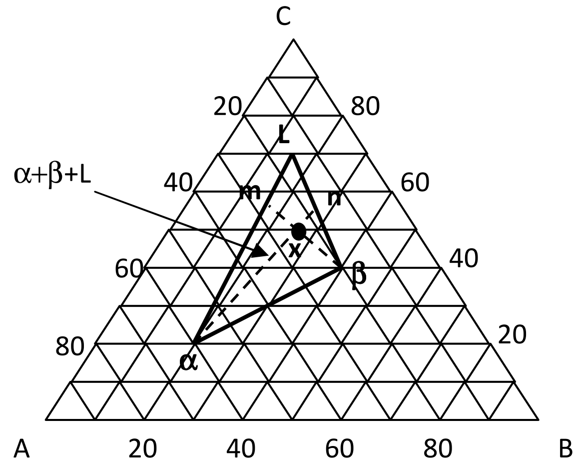
1.



2. Isothermal section at temperature T is given in the following figure. Alloy composition is represented by point x. This lies within a triangle whose vertices denote the composition of α, β and liquid. Join the points α & β with x and extend these lines to meet the opposite side at points m & n. Measure the lengths αn, xn, βm &xm.

$$\%\alpha = \frac{xn}{\alpha n} \times 100$$

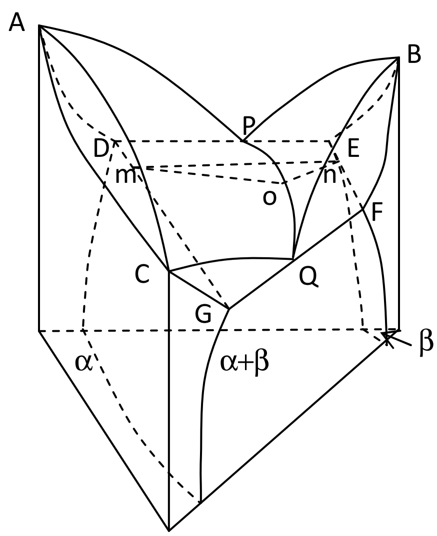
$$\%\beta = \frac{xm}{\beta m} \times 100$$



3. Alloy having 50% α + 50% β is the mid point of tie line αβ of the above diagram. In this case it is 40%A 30%B 30%C

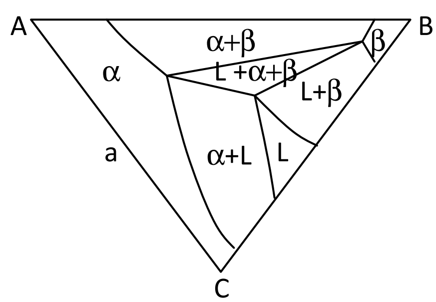
4. Sketch of the 3-D model of this system:

(a)



Note: line joining eutectic point P with Q is above the surface joining DEFG. There is a surface joining lines DE with FG passing through line PQ. Triangle mno is a section of the region between these two surfaces.

(b)



(c)