culate fraction of mass of phases for solid and Liquid at 1250°C

given. M.P of A is 1050°C

M.P of B is 1900°C

solid composition = 80%

Liquid " = 30%.

and over all composition = 75%

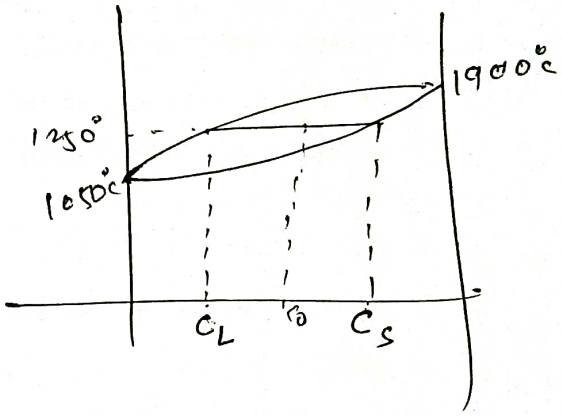
Soln. at 1250°C

fraction mass for Liquidus phase

$$m_L = \frac{C_s - C_0}{C_s - C_L}$$

$$= \frac{80 - 75}{80 - 30}$$

$$= 0.1 = 10\%.$$



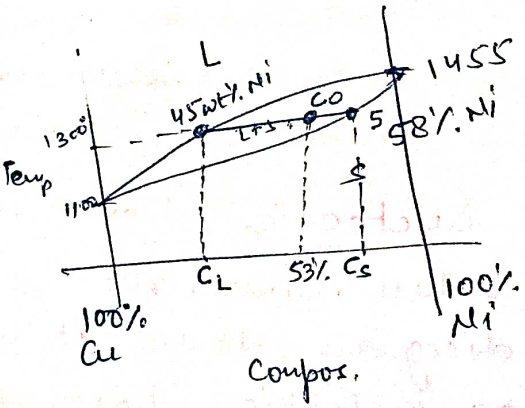
and for solidus phase.

$$m_s = \frac{C_0 - C_L}{C_s - C_L}$$

$$= \frac{75 - 30}{80 - 30}$$

$$= 0.9$$

$$= 90\%$$



Q. A Copper-Nickel alloy contain 47 wt% Cu and 53 wt% Ni and is at 1300°C. find what is weight% of Cu in (L+s) Phase at this temp. (ii) what weight% of this alloy is liquid and what % is solid.

$C_0 = 53\%$ Ni. $C_L = 45\%$ Ni, $C_s = 58\%$ Ni

Weight fraction of liquid phase

$$W_L = \frac{C_s - C_0}{C_s - C_L} = \frac{58 - 53}{58 - 45} = \frac{5}{13} = 0.38$$

So, wt% of liquid = 0.38 × 100 = 38%

$$W_s = \frac{C_0 - C_L}{C_s - C_L}$$

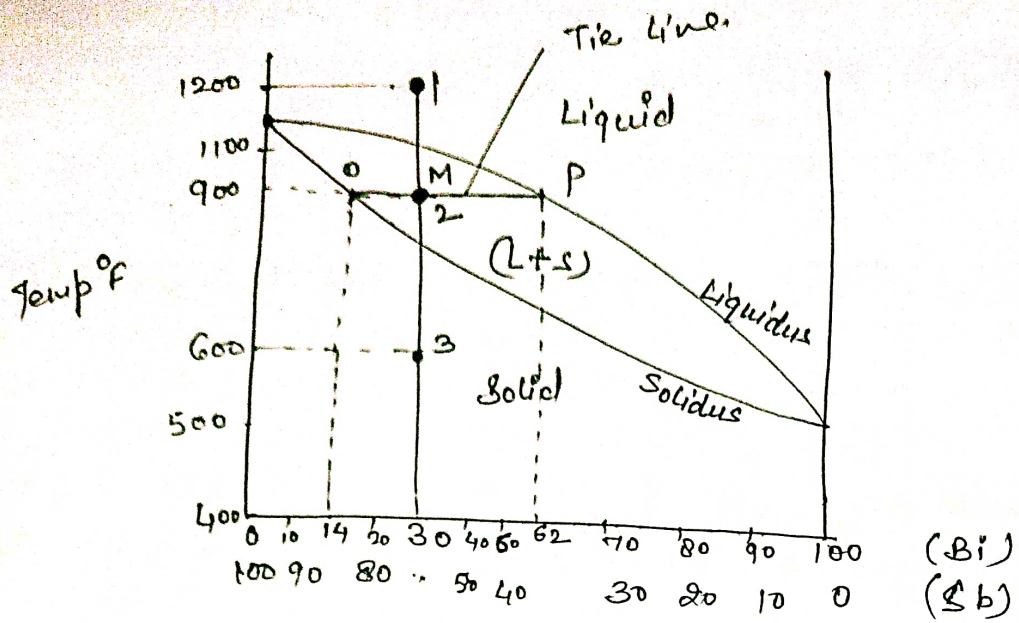
$$= \frac{53 - 45}{58 - 45} = \frac{8}{13}$$

$$= 0.62$$

wt% of solid = 0.62 × 100

= 62%.

Binary phase diagram for Bismuth & Antimony.



* From phase diagram, specific information can be obtained only if a temp. and composition are specified.
* At point 1 with 30% Bi - 70% Sb alloy at 1200°F only one phase i.e liquid solution is present.
* A point 2, with same alloy but at 900°F two phase are present i.e liquid and solid phase.
* With the same alloy but at 600°F only one phase i.e solid solution is present.

Similar analysis can be made for any other alloy composition and temp. in the phase diagram.

* Now to find out the composition of phases tie line has been drawn in Mushy zone OP.

→ The point P liquid phase has a composition 62% Bi and 38% Sb.

→ The point O solid phase has a composition 14% Bi and 86% Sb.

Lever Arm Principle →

To determine the relative arm

① Amount of solid phase. (% of solid present)

$$= \frac{MP}{OP} \times 100 = \frac{(62-30)}{(62-14)} = 66\frac{2}{3}\%$$

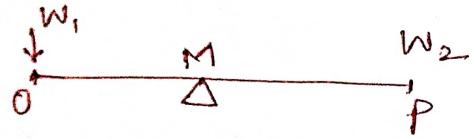
② Amount of liquid phase (% of liquid present)

$$= \frac{OM}{OP} \times 100 = \frac{30-14}{62-14} \times 100 = 33\frac{1}{3}\%$$

The relative length of lever arm multiplied by the amount of phase present must balance.

This is called lever rule because amount of given phase multiplied by its lever arm is equal to amount of other phase multiplied by its lever arm.

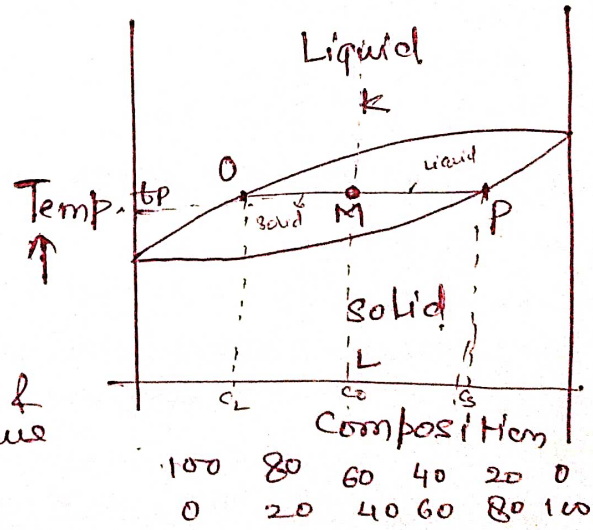
To determine the relative amount of each phase that is present in phase diagrams some relation will be used, which is known as LEVER RULE.



Lever rule →

$$W_2 \times MP = W_1 \times OM$$

$OM + MP = OP$ → Total composition of alloy b/w liquidus & solidus



% of solid present $= \frac{OM}{OP} \times 100$

% of liquid " $= \frac{MP}{OP} \times 100$

$$M_L = \frac{C_S - C_0}{C_S - C_L} \quad \& \quad M_S = \frac{C_0 - C_L}{C_S - C_S}$$