System in which two components form a stable compound:

① **Formation of compounds with congruent melting points:**

A compound is said to possess a congruent melting point if it melts sharply at a constant temperature into a liquid of the same composition as the solid.

e.g. Ferric chloride – water system:

The four stable hydrates of ferric chloride are:

ⓐ $Fe_2Cl_6 \cdot 12H_2O$ ⓒ $Fe_2Cl_6 \cdot 5H_2O$

ⓑ $Fe_2Cl_6 \cdot 7H_2O$ ⓓ $Fe_2Cl_6 \cdot 4H_2O$

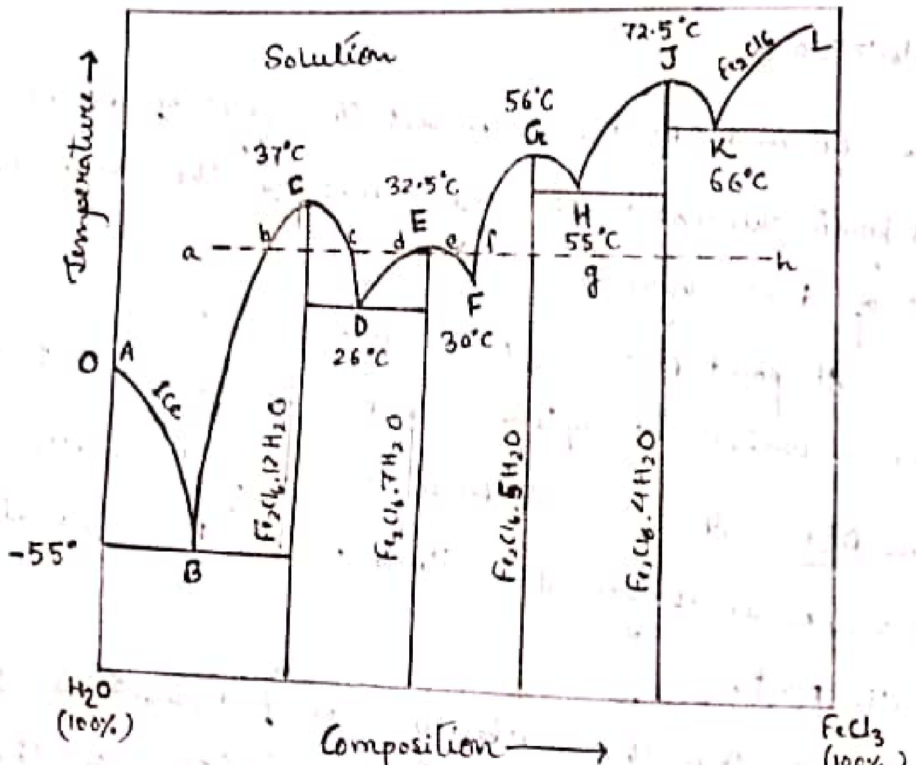

Fig: Ferric chloride – water system.

Point A: The point A in the figure represents the freezing point of water (0°C) at 1 atm pressure. When ferric chloride is added to it slowly, the temp^r of the solution falls along the curve AB. So, along the curve AB there are two components ($FeCl_3$ and water) and two phases (ice and solution), AB is monovariant. With continuous addition of $FeCl_3$, The temperature will go on decreasing till the eutectic temperature is reached. At this point B, $Fe_2Cl_6.12H_2O$ separates as a new solid phase. Point B is invariant, as it has 3 phases. Here the temp^n becomes $-55°C$, which is the lowest temperature that can be obtained in this system.

On further add^n of $FeCl_3$ and heating, ice melts and the no. of phase becomes two. Hence, the system becomes monovariant. The temp^n rises and the composition of the system changes along BCD, which is called solubility curve of $Fe_2Cl_6.12H_2O$. Point C (37°C) is the congruent melting point of $Fe_2Cl_6.12H_2O$.

Curve CB and CD: They represent the effect of adding water and ferric chloride respectively in lowering the congruent melting point of dodecahydrate.

At point D (26°C), $Fe_2Cl_6.7H_2O$ separates a new solid phase. It is a univariant system and it is the second eutectic point.

Curve DEF: It is the solubility curve of $Fe_2Cl_6.7H_2O$ and E (32.5°C) is its congruent melting point. F (30°C) is the third eutectic point.

Curve FGH: It is the solubility curve of $Fe_2Cl_6.5H_2O$. Its congruent melting point is G (56°C). H (55°C) is the fourth eutectic point.

Curve HJK: It is the solubility curve of $Fe_2Cl_6.4H_2O$. Its congruent melting point is J (72.5°C). At point K (66°C) anhydrous ferric chloride separates out. It is the fifth eutectic point.

Curve KL: It represents the solubility curve of anhydrous ferric chloride.

Non-variant points: The congruent melting points C, E, G and J are non-variant points.

(2) Formation of compounds with Incongruent melting points:

In some system, the compounds formed by the combination of two components, decompose when heated giving a new solid phase and a solution with a composition different from that of the solid phase. Such a compound is said to possess incongruent melting point.

$$\underset{\text{(Original)}}{S_1} \rightleftharpoons \underset{\text{(New solid)}}{S_2} + \text{Solution or melt.}$$

Its decomposition at this temp is called transition reaction. Thus, the incongruent melting point is called transition temperature or Peritectic temperature.

~~Sodium Sulphate~~

Sodium - Potassium:

Sodium-Potassium is an example of incongruent melting point.

Sodium and potassium ions are pumped in opposite directions across the membrane building up a chemical and electrical gradient for each. These gradients can be used to drive other transport processes. In nerve cells, the pump is used to generate gradients of both sodium and potassium ions. Potassium is a very significant body mineral important to both cellular and electrical function. It is one of the main blood minerals called electrolytes, which means it carries a tiny electrical charge. The Na/K pump's job is to move potassium ions into the cell while simultaneously moving sodium ions out of the cell. This process is important for a variety of reasons. Such as, in nerve cells, the Na/K pump creates gradients of both sodium and potassium ions.