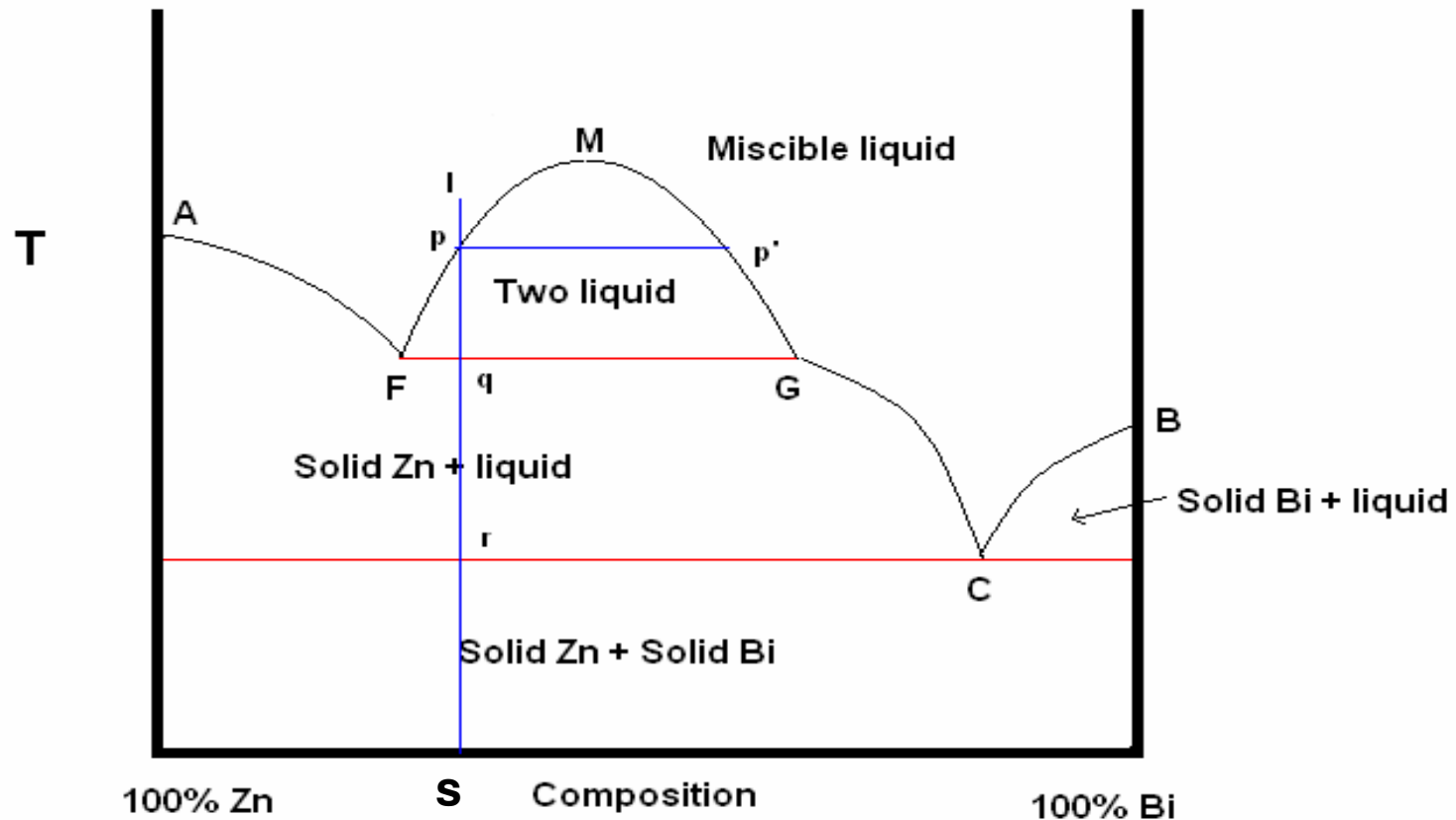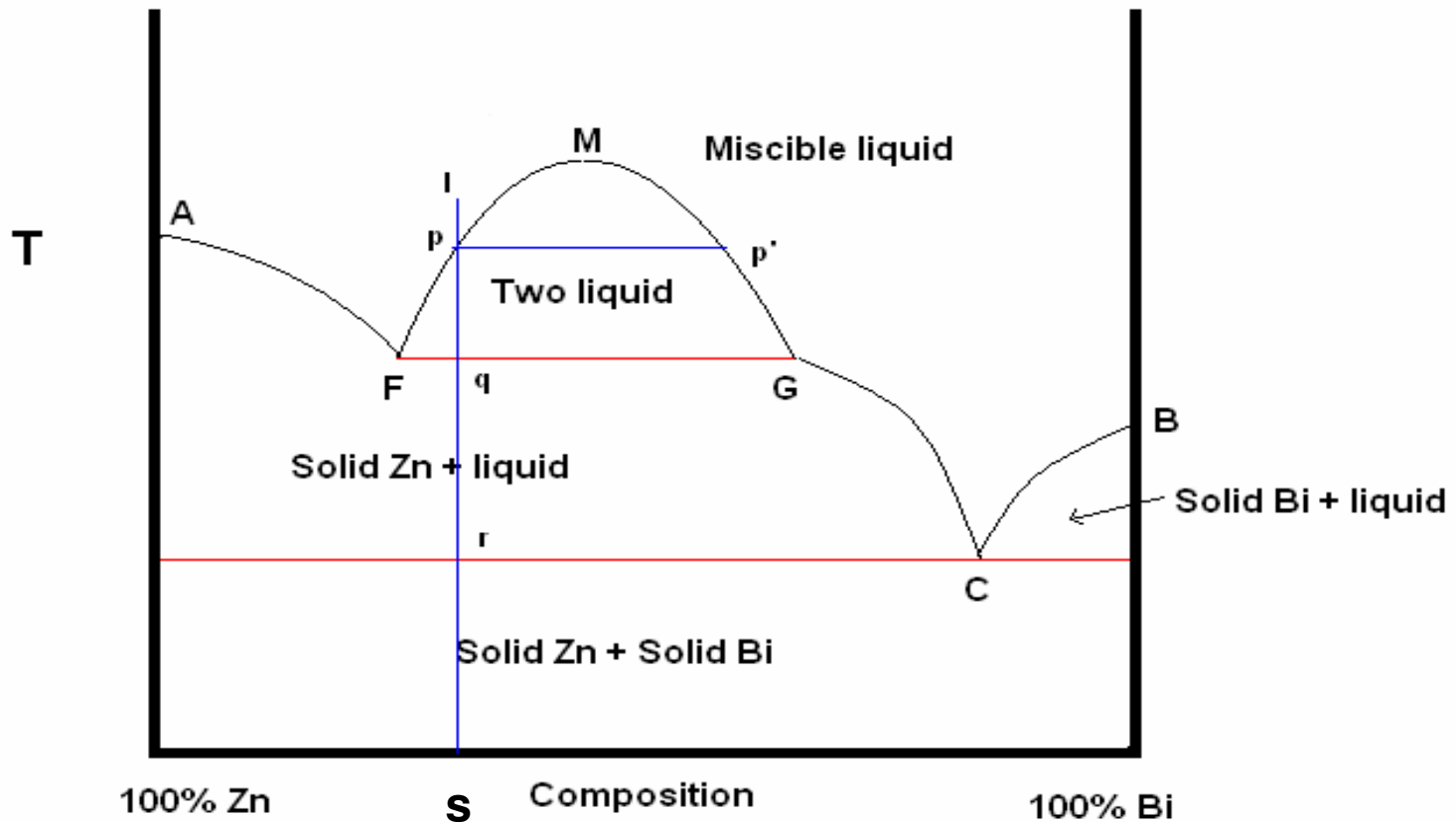# Eutectic system with liquids partially miscible

Example Zn-Bi system, which gives the above diagram.

This diagram shows partially immiscible over certain composition range.

- The area above AFMGC is miscible liquids in all proportions.

- Area FMG is the immiscible two liquids

- AF and BC lines are the solubility curves for Zn and Bi, respectively.

- GC represents a continuous solubility line for Zn

- The two liquid layers are produced and they represented by F and G (F is richer in Zn and G is richer in Bi), and they are in equilibrium with Zn solid. These pots are invariant systems.

2
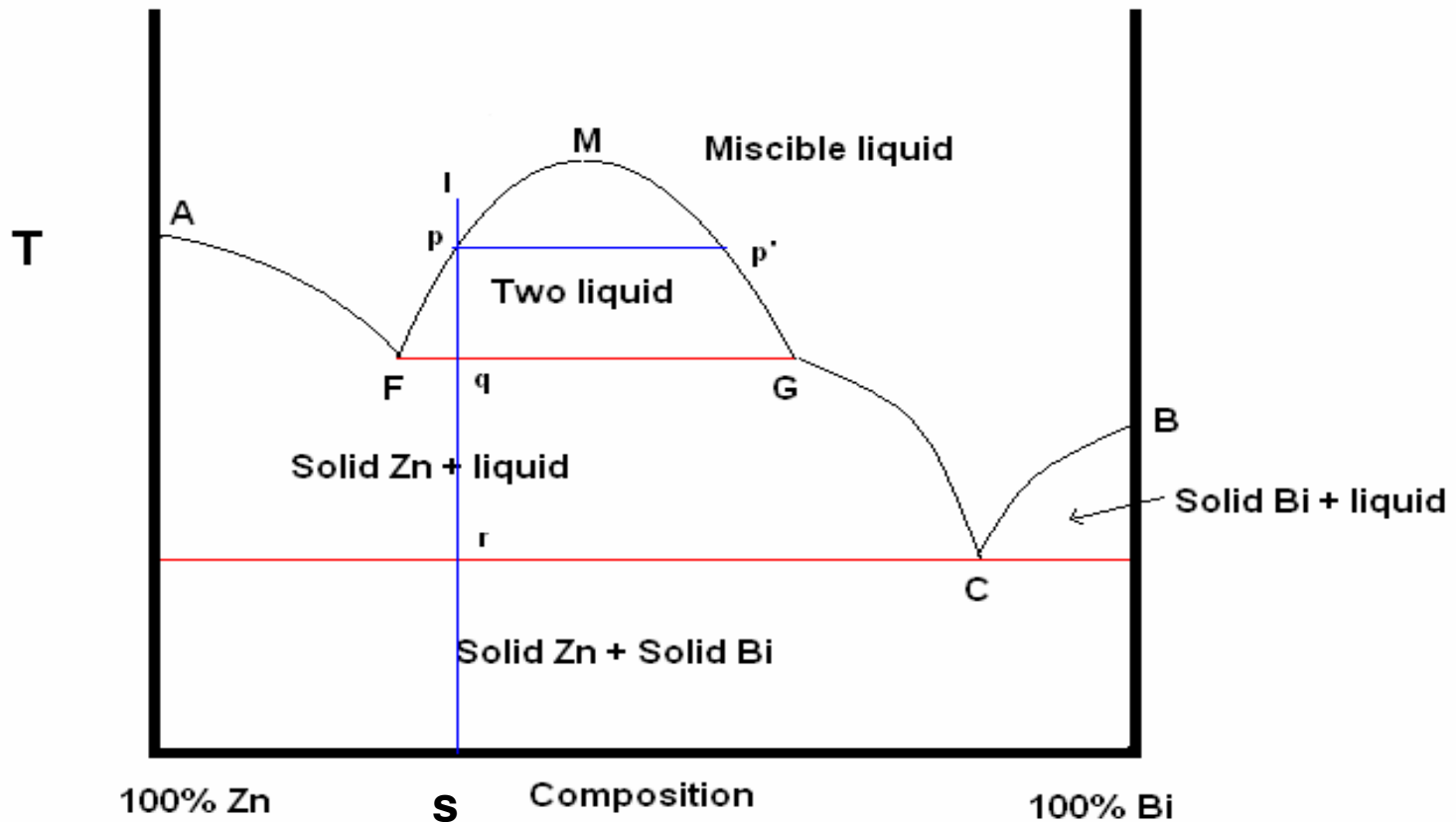
- **If liquid I is cooled, it form two immiscible liquid at p (with composition p and p').**
- **With further cooling, both liquids composition change along pF and p'G.**
- **At q, the liquid layers are F and G, then Zn solid separates and the temperature remains constant.**
- **With continuous deposition of Zn, the layer with rich Bi (composition G), increase in amount and second layer disappear, then the temperature fall again.**

3
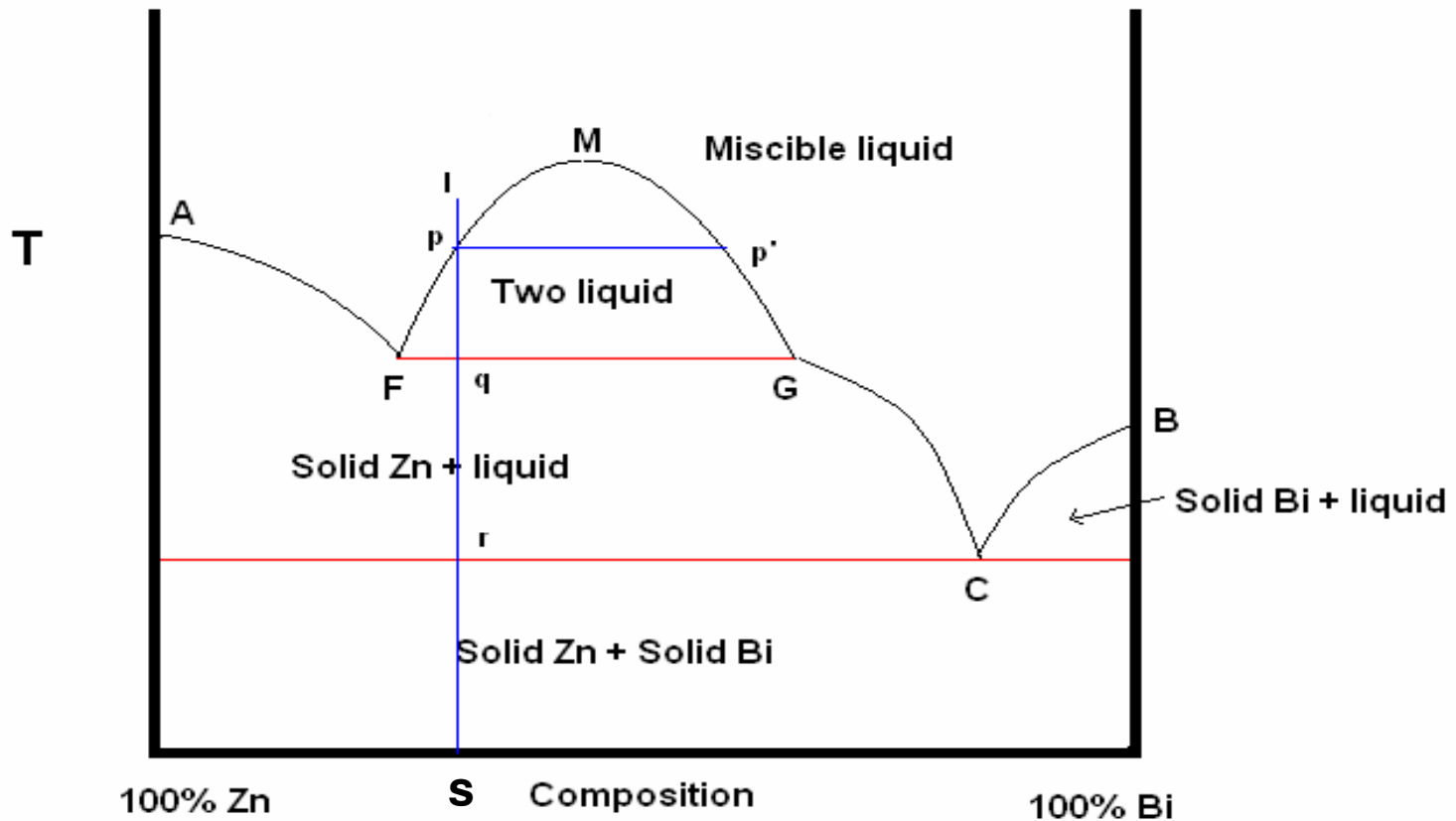
- **From q to r, Zn solid in equilibrium with liquid which composition change along GC.**
- **At eutectic point C, the second solid start to separate and temperature again remains constant until liquid disappear.**
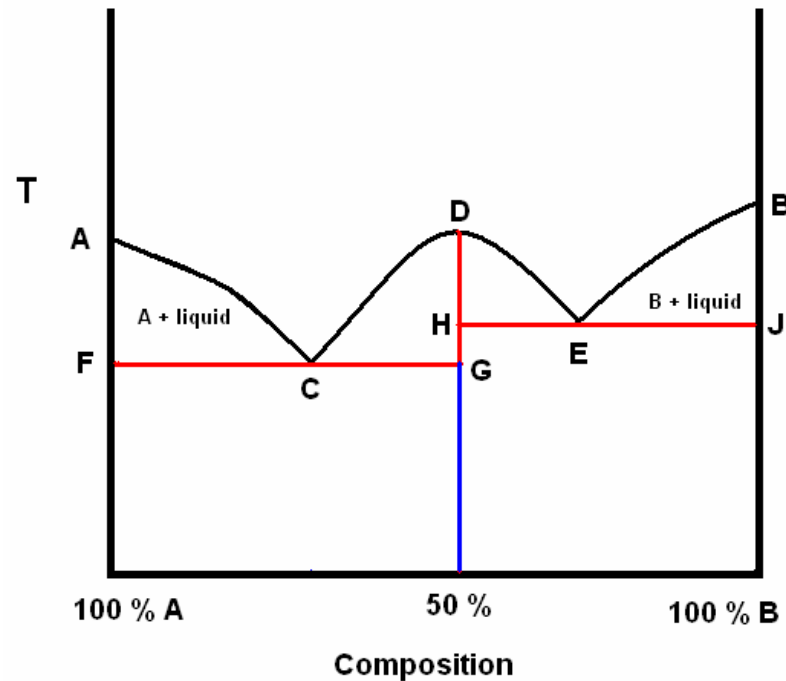- **The mixture Zn and Bi solids cool along r s**

Compound with congruent melting point

It is capable of existing as a stable solid in equilibrium with a liquid of the same composition.

All melting points of pure substances are congruent.

When two components A and B combines to form a stable compound AB, this diagram is obtained.

Example: Mg-Zn and Al-Mg
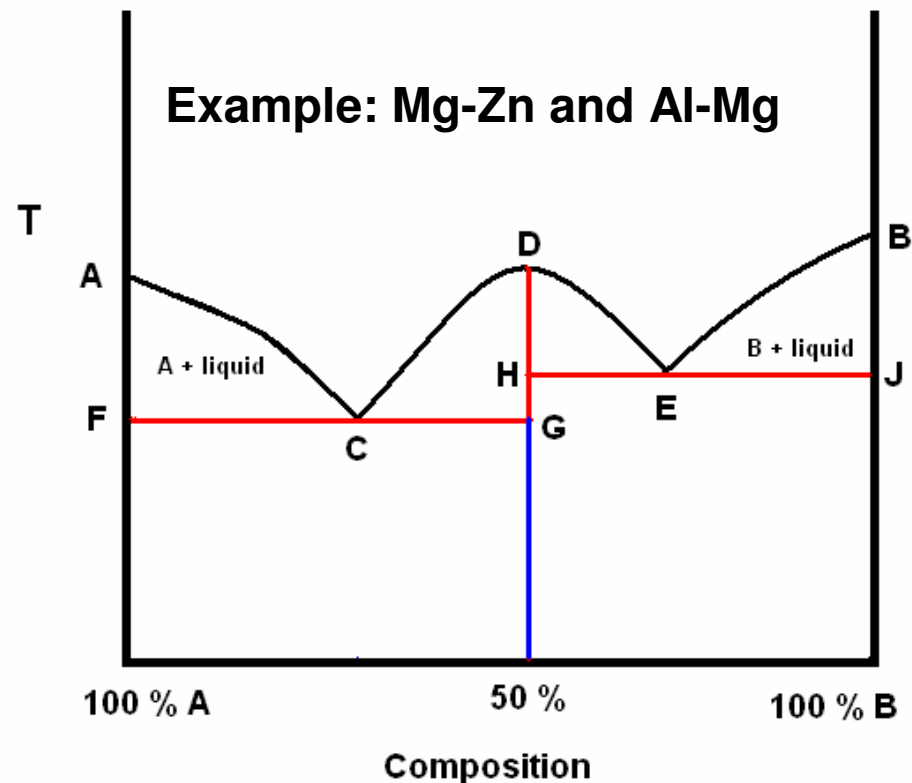
- Line AC, depression line of A by addition of B.
- Line BE, depression line of B by addition of A.
- Area ACF, equilibrium between A and liquid.
- Area BEJ, equilibrium between B and liquid.
- Triple point C, is an eutectic point of solid A, solid component AB, and liquid.
- Triple point E, is an eutectic point of solid B, solid component AB, and liquid.
- Maximum at D, it is the characteristic of formation of stable compound AB, it has mp at D.

T

A

D

B

A + liquid

B + liquid

H

E

F

J

C

G

100 % A

50 %

100 % B

Composition
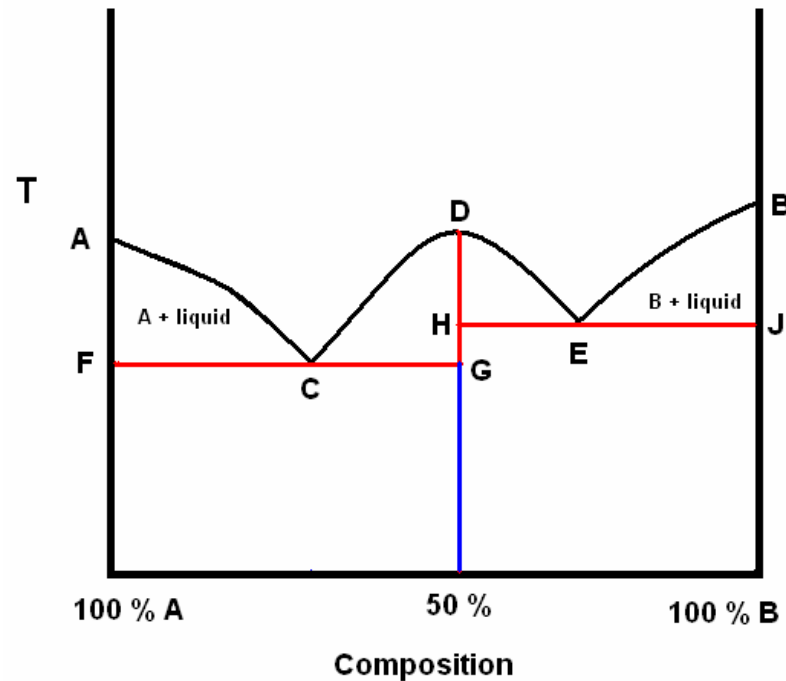
- DC line: the depression melting line of AB by addition of A.
- DE line: the depression melting line of AB by addition of A.
- Areas DCG and DEG represent the equilibrium AB solid with liquid.
- Below line HJ, solid AB and solid B are present.
- Below line FG, solid AB and solid A are present.
- The phase diagram like two diagrams joined together along the line DG.
- If a liquid composed of 50% A and 50% B, cooled down to D, the temperature will remain constant until all liquid solidifies with same composition as liquid. Thus D is the congruent mp of AB.

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