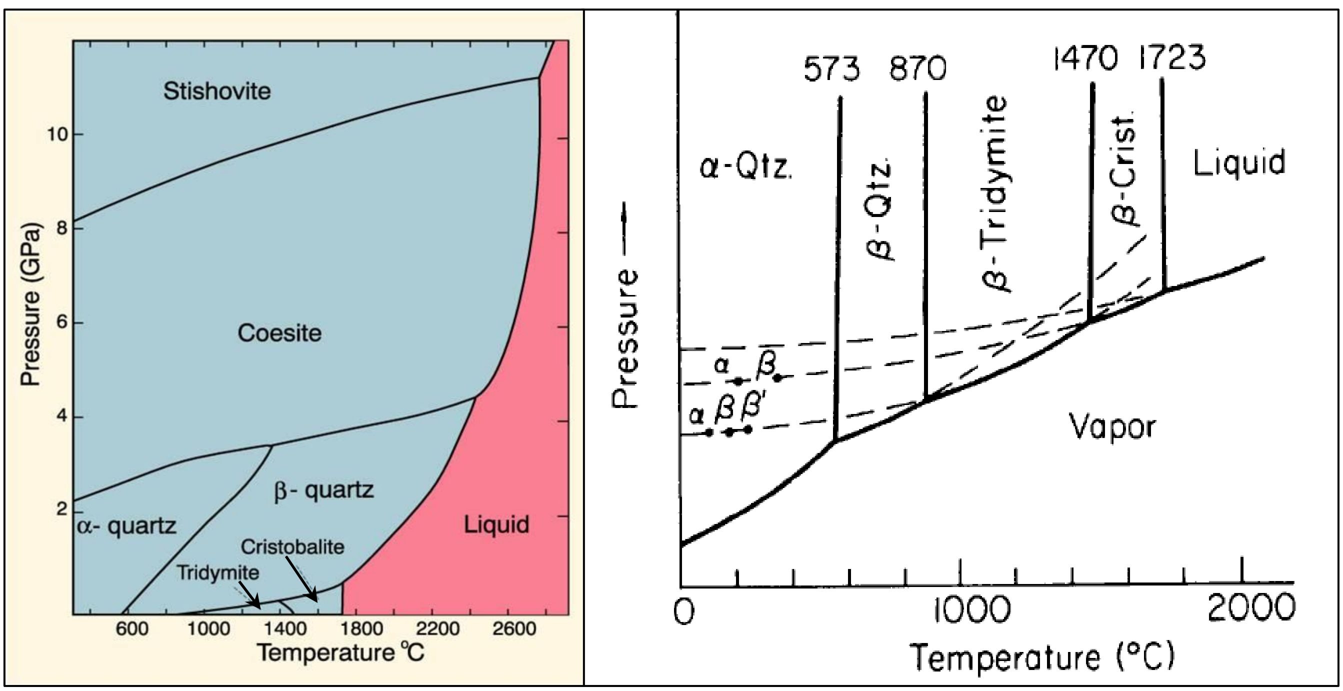
2-2-2 Examples of The one-component system:

1- The Silica System (SiO_2):

Most ceramic crystals have very high melting points, and the vapor pressures of these crystals are very low and have not been measured. However, the phase diagram can be drawn since the relative stability of the phases is known. Such is the diagram of the SiO_2 system shown in fig.(4).

Fig.(4) shows the many polymorphic forms of SiO_2, crystals. Polymorphism is the term used to indicate the existence of the same chemical composition in two or more crystalline forms, each having its own characteristic vapor pressures and temperature ranges of stability and metastability and being distinguished by its different crystalline structure and physical properties.



(A) (B)

Fig.(4) (A) Phase diagram for silica system SiO_2 at higher pressures

(B) Stability relations in the silica system at atmospheric pressure

The polymorphic forms of silica crystals are:

1- At room temperature, the stable form of silica is α-quartz.

2- At 573°C, α-quartz will change to β-quartz.

3- On cooling, β-quartz will revert to α-quartz.

4- At 870°C, stable β-quartz will change to β-Tridymite.

5- At 1470°C, β-Tridymite will change to β- Cristobalite.

6- At high temperature, metastable β-quartz will change to β-Cristobalite or melt to liquid silica.

2- The Titania System (TiO_2):

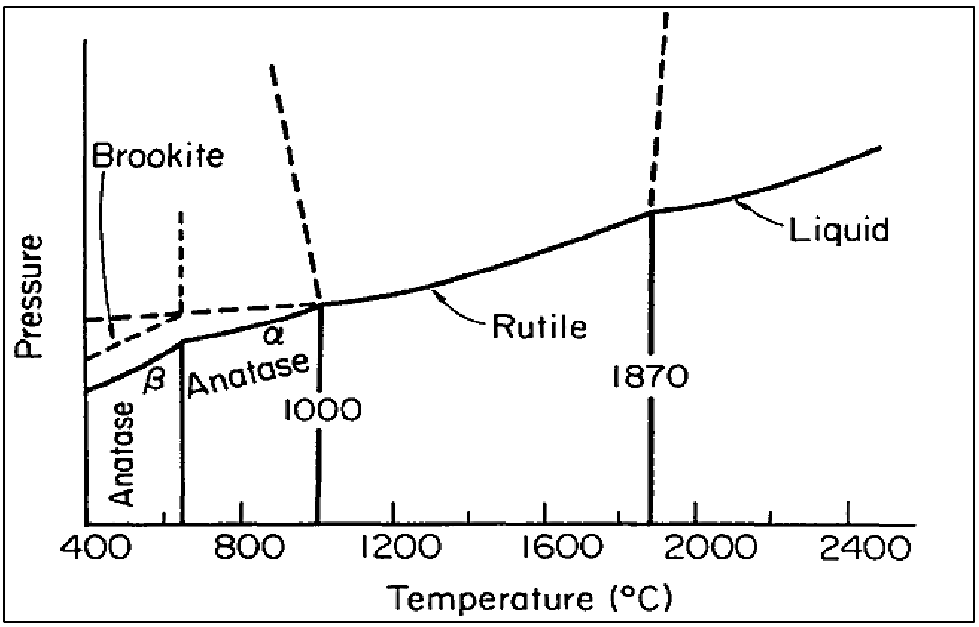


Fig.(5) Stability relations in the titania system

The polymorphic forms of titania crystals are:

1- At low temperature, the stable form of titania is β-Anatase modification exists in two forms β, and α Anatase which change reversibly .

2- At 642°C, β-Anatase reversibly change to α-Anatase.

3- At 1000°C, α-Anatase reversibly change to Rutile.

4- At 1870°C, Rutile melts.

5- At 650°C Brookite change to Rutile.

3- The Zirconia System (ZrO_2):

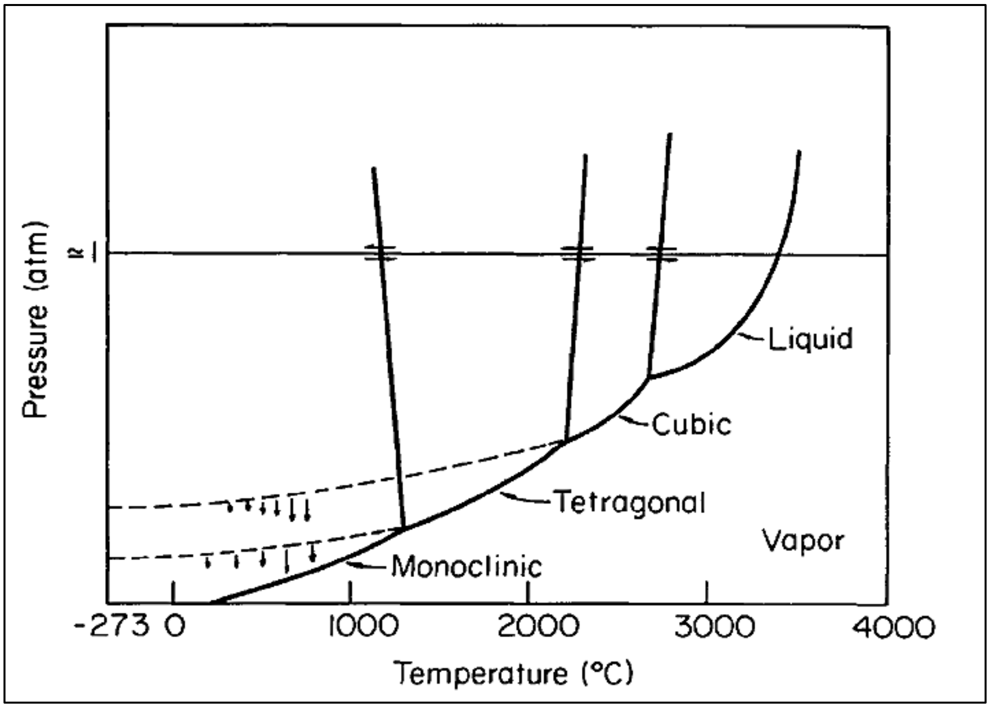


Fig.(6) Proposed diagram for the zirconia system (ZrO2)

The polymorphic forms of zirconia crystals are:

1- At low temperature, the stable form of zirconia is monoclinic zirconia.
2- At 1000°C, monoclinic zirconia reversibly change to tetragonal zirconia.
3- At 2300°C, tetragonal zirconia reversibly change to cubic zirconia.
4- At 2715°C, cubic zirconia melts.

4- The Carbon System:

The conditions for the formation of diamonds are shown on the carbon phase diagram which is shown in fig. (7). For the direct conversion of graphite to diamond, temperatures above **(4000)˚C** and pressures approaching **(150)** kbars are required. By the use of suitable catalysts, the conversion can be made at considerably lower temperatures and pressures. Attempts to manufacture diamonds by subjecting carbon to high temperatures and pressures formed the basis for a myriad of experiments which began about the year 1800.

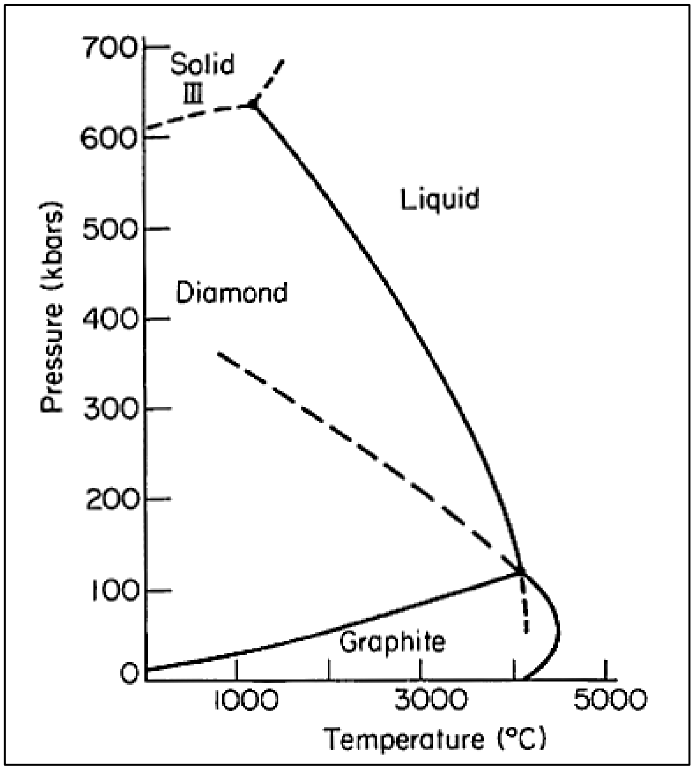


Fig. (7) Proposed diagram for carbon system.