Phase Transitions

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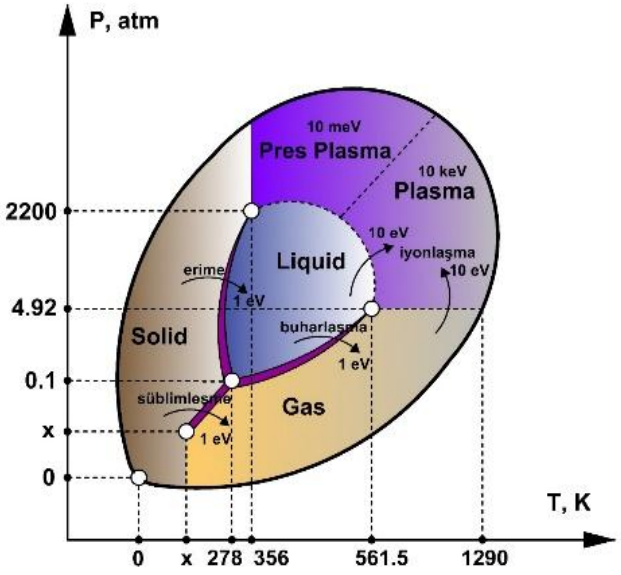
The relationship between pressure and temperature of a specific substance where phase transformation occurs can be found by its own P-T diagram.Three phases, the boundary curves that separates the phases, the critical point and the triple point can be shown in the phase diagram of a pure substance. What can be the results of the investigation of this diagram with the graphical method? Increasing of the temperature above the critical point causes the disappearance of the line between the liquid and the gas phases and the substance become single phase. In this diagram, critical pressure and temperature were represented as P_{kr} and T_{kr}, respectively. In the scenario of the increasing the pressure, the critical point could not be found in the phase diagram even at the temperatures from 273K to 473K and at the pressure of 1.25GPa. On the other hand, some studies showed that when the pressure was 10^2-10^3 atm, the difference in the liquid-gas phase transition was eliminated, and in the case of a pressure of 10^6 atm, a metallic bond was formed. At higher pressures, non-uniform conglomeration of the plasma-like electrons and nucleuses was observed. In the same way, it was reported that at pressures of 10^3-10^5 atm, the variance in the phase transition of solid-liquid was vanished. To study these cases, an experimental set-up was constructed and experiments were performed.

William Kelvin showed the interception of isochors at a point on the T axes by using the graphical method in P-T (at constant v) diagram, for the first time in 1840. This point was called as an absolute temperature (T = 0K). By applying the same method to the ρ-T (at constant P) diagram, it was found that the isobars intercepted in the direction of increasing temperature on T axes. This point represents the temperature of dissociation and ionization of a substance. When the same method was used to ρ-P (at constant T) diagram, another point was assigned where the isotherms were intercepted on the solid-liquid-gas equilibrium curve. This point indicates the critical pressure and it is specific to each substance. According to the results of the graphical method, the phase diagram of a pure substance can be plotted.



P-T Phase Diagram of Benzene