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Phase Transition in Superconductor

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Abstract : Phase transitions occur in a great variety of physical systems such as paramagnet-ferromagnet, fluid-superfluid, amorphous-crystalline, and normal-superconducting transitions. Temperature-induced phase transition has been observed in the phenomenon of superfluidity and superconductivity. In regard to superfluidity, extraordinary behavior is observed for liquid Helium below the transition temperature and even at normal state. Both the liquids ^{3}He and ^{4}He (Isotopes of He) do not have a triple point (solid-liquid-gas) and co-exist with a single point. According to the new classification, latent heat involvement in a system, phase transition can be named as 1st order or 2nd order. It is known that the entropy of material gives disorderliness to the system. A discontinuous change of free energy (Gibb's free energy) at a fixed temperature provides a change called 1st order, and continuous change is called as second-order phase change. The solid-liquid, liquid-gas transitions below the critical temperature are examples of 1st order phase transition. Similarly, metal-superconductor transition, and magnetic (ferromagnetic-paramagnetic) ordering transition show a 2nd order phase transition. The high pressure-induced in some materials exhibit the properties of room-temperature superconductors.

Keywords :phase transition; superconductivity; Bose-Einstein Condensate; order parameter; symmetry breaking; superfluid

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