The study of liquid-gas phase transition in finite nuclear systems is of considerable contemporary interest. Experimental analyses of the accumulated data on multifragmentation and caloric curves show compelling evidence of such a transition. Phase transitions are normally signaled by peaks in the heat capacity with rise in temperature. Theoretical models of different genres, such as the micro canonical or the canonical description of multifragmentation, the lattice–gas model or even the microscopic treatment in a relativistic or a non-relativistic Thomas-Fermi framework support such a structure in the heat capacity. A clear idea about the subtle details of the liquid-gas phase transition in finite nuclei, however, has not emerged yet. Confusion remains about whether the system has evolved dynamically through the critical point; a coherent picture about the order of the phase transition is also missing. Analyses of the experimental data by the EOS group and the ISiS group give strong circumstantial evidence for a continuous (second order) phase transition. Calculations performed in the mean-field model also lead to a similar conclusion. Predictions from the lattice-gas model calculations are, however, compatible with a first order transition. Anomalous negative heat capacities as obtained from fluctuation analysis in energetic heavy-ion collisions have been claimed as indicators of first order phase transition. However, questions have been raised on the origin of the negative heat capacity for nuclear systems with mass number $A>60$.

The liquid-gas phase transition in infinite asymmetric nuclear matter with explicit conservation of baryon number and total isospin has been investigated [1] in a mean field framework employing the Skyrme-like $SKM^\ast$ interaction. The calculations have been extended for finite nuclei in a heated liquid-drop model where the drop is assumed to be in thermodynamic equilibrium with its emanated vapor. As observed earlier for infinite asymmetric nuclear matter in a relativistic mean field model, we observe in this non-relativistic calculation that the pressure changes continuously along the liquid vapor coexistence line for infinite asymmetric system as well for finite nuclei, symmetric or asymmetric. The neutron and proton concentration in the liquid and the vapor phase are found to be very different resulting in the so-called isospin fractionation. For systems with $N > Z$ that we have investigated, both infinite and finite, the gas phase is always found to be neutron-rich. For symmetric finite system, however the gas phase is mostly proton-rich. This is likely to be signaled from the predominant production of proton-rich isotopes in collisions between medium-heavy symmetric nuclei. The peaked structure in the heat capacity indicates further the occurrence of liquid-gas phase transition. From the evolution of entropy at constant pressure, it is seen that the transition occurs over range of temperatures contrary to fixed temperature in the first order transition; this suggests that the liquid-gas phase transition in a finite nuclear system is continuous in the mean field model we adopt. However, the said temperature interval is comparable, if not less, to the present day accuracy in the temperature measurement. Thus the continuous nature of the transition found in our calculation would be hard to disentangle from the first order transition. The thermodynamic
concepts we use may not be very meaningful when the number of particles in one of the phases is very small, still this model serves as a window to understand the basic features of liquid-gas phase transition in finite system.