PHASE TRAJECTORIES OF THE NUCLEAR SYSTEM IN THE PROTON INDUCED MULTIFRAGMENTATION PHENOMENA. MECHANICAL BREAKDOWN

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There are well established statistical/dynamical nuclear MF models but a number of questions still remains unsolved [1]. It is necessary to have the overall picture of the phenomenon for better understanding the nature of the physical processes ongoing in the system. The aim of the work is to proceed with the general macroscopic picture of the proton-induced nuclear multifragmentation rather than its microscopic description or precise quantitative calculations. Based on the thermodynamic analysis of the proton-induced multifragmentation phenomena the most appropriate decay channel is chosen. Macroscopic analysis of the suggested decay channel is done in order to check the possibility of the mechanical breakdown of the heated system. In order to do this the simple "classical mechanical" model corresponding to isochoric heating at the start with the adiabatic expansion to follow is introduced. Namely it is the breakdown of the spherical system with high pressure in the inner part and the outer shell in the ground state, possibly with a wake left behind the projectile in the first stage of the process. In this work we try to use as simple model (corresponding to the appropriate phase trajectory of the nuclear system) that represents the single-phase process in the small inner part of the system as possible allowing straight forward thermodynamic analysis in order to have the clear macroscopic picture of the phenomenon. Based on a simple thermodynamic model preliminary quantitative calculations of corresponding macroscopic parameters (energy, pressure) are done and therefore the model verification on macroscopic level is held. It is shown that on macroscopic level the mechanical breakdown of the thermodynamic system in a single-phase [2] process that may be followed by metastable boiling is a good and quite adequate candidate for explaining the proton-induced multifragmentation phenomena.

1. I.J.Thompson // Comput. Phys. Rep. 1988. V.7. P.167.
2. A.T.Rudchik *et al*. // Nucl. Phys. A. 2003. V.714. P.391.