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Thermodynamics of Nuclear Matter at High-Energy Nuclear Reactions.

The experimental data from various hadronic and heavy-ion collisions have been studied to investigate nuclear matter under extreme temperature and pressure. Under such conditions, the nuclear matter undergoes different phase transitions from the hadronic matter to the quark-gluon plasma (QGP) matter. Also, there are several experimental indicators that allow studying different regions of the quantum chromodynamics (QCD) phase diagram through the hadron and ion collisions. Therefore, the phase transition mechanism was investigated using thermo-statistical models based on the correlation between the distribution of measurable experimental quantities, such as the transverse momentum and multiplicity of the produced charged particles, and the microscopic hypotheses of the transition mechanism. The used analysis tools could describe the experimental data over the considered energies and rapidity intervals. Moreover, the analysis of the experimental data in view of Tsallis'statistics has enabled me to obtain the values of the temperature, chemical potential, and non-equilibrium index (q) at the kinetic freeze-out stage, which reveals the possible mechanism of particle production through proton-proton and heavy ion collisions at the center of mass energy in the GeV and TeV regions.

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