

Isospin dependent multifragmentation of relativistic projectiles

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The N/Z dependence of projectile fragmentation at relativistic energies has been studied with the ALADIN forward spectrometer at SIS [1]. Stable and radioactive Sn and La beams with an incident energy of 600 MeV per nucleon have been used in order to explore a wide range of isotopic compositions. For the interpretation of the data, ensemble calculations with the Statistical Multifragmentation Model [2] were performed and an overall very good agreement with the experimental fragmentation observables was obtained. The parameters of the ensemble, representing the variety of excited sources expected in a participant-spectator scenario, are determined empirically by searching for an optimum reproduction of the measured fragment charge distributions and correlations.

The possible modification of the liquid-drop parameters of the fragment description in the hot environment is studied, and a significant reduction of the symmetry term coefficient is found necessary to reproduce the mean neutron-to-proton ratios $\langle N \rangle / Z$ and the isoscaling parameters of $Z \leq 10$ fragments. Because of the overlap of the freeze-out conditions with those encountered in supernova scenarios, this is of astrophysical interest [3]. The calculations are, furthermore, used to address open questions regarding the modification of the surface-term coefficient at freeze-out, the N/Z dependence of freeze-out temperatures, and the isotopic evolution of the spectator system between its formation during the initial cascade stage of the reaction and its subsequent break-up.

[1] C. Sfienti et al., Phys. Rev. Lett. 102, 152701 (2009).

[2] J.P. Bondorf et al., Phys. Rep. 257, 133 (1995).

[3] A.S. Botvina and I.N. Mishustin, Phys. Lett. B 584, 233 (2004) and arXiv:0811.2593 (2008).