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Local baryon-strangeness correlation from hypernuclei and coalescence volume from light nuclei in relativistic heavy ion collisions

The production of hypertriton and light nuclei are simulated in a dynamical coalescence model coupled with a multi-phase transport model (AMPT)~\cite{SZhang10}. The beam energy dependence of strangeness population factor, $S_3 = {}^3_\Lambda H/({}^3He \times \frac{\Lambda}{p})$, is calculated to study local baryon-strangeness correlation as a valuable tool to probe the nature of the dense matter created in relativistic heavy ion collisions. We find that AMPT with string melting predicts an increase of S_3 with increasing beam energy, and is consistent with experimental data, while AMPT with only hadronic scattering results in a low S_3 throughout the energy range from AGS to RHIC, and fails to describe the experimental data. And we analyzed coalescence parameters, B_2 and B_3, based on the production of deuteron, helium-3 and proton. The coalescence parameters of B_2 and B_3 decrease with increasing of beam energy or number of participant. The value of B_2 and B_3 in this model are consistent with the measurement by experiment collaboration in nucleus-nucleus collisions at different beam energy~\cite{NA49-07} or in different centralities~\cite{STAR09}. The freeze-out correlation volume, V_f^{1-A} (A is atomic number), is calculated in AMPT model. The results of coalescence parameter and the freeze-out correlation volume follow the relation of $B_A \propto V_f^{1-A}$, which is from coalescence mechanism and observed in experiments~\cite{BAVf,STAR09,HLiu06}. This beam energy and system size dependences indicate the increase of source size in more high energy collisions and in more central collisions.

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