Dynamics on particle production, in particular pions, kaons, antikaons and hyperons, has been investigated within the LQMD transport model. The yields of pions, kaons and antikaons are mainly contributed from the annihilations of antiproton on nucleons. Hyperons are dominated via the meson-nucleon collisions and strangeness exchange reactions when the incident momentum is below the annihilation threshold value, *i.e.*, $\overline{\mathrm{N}}\mathrm{N} \rightarrow \overline{\Lambda}\Lambda$ ($p_{\mathrm{threshold}}$=1.439 GeV/c).

References

[1] Z. Q. Feng, H. Lenske, Phys. Rev. C, 89(2014)044617.

[2] E. S. Golubeva, A. S. Iljinov, B. V. Krippa, I. A. Pshenichnov, Nucl. Phys. A, 537(1992)393.

1 - 5 Probing Nuclear Symmetry Energy by π^-/π^+ Ratio below the Pion Production Threshold *

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π^-/π^+ ratio was found to be a sensitive probe to the high-density behavior of the symmetry energy by using several transport models. However, as shown in Fig. 1, at beam energies below the pion production threshold, the effects of in-medium nucleon-nucleon scattering cross section (which is still controversial) strongly affect the value of π^-/π^+ ratio[1]. It is thus necessary to do a comparative study of the effects of the in-medium NN cross section and the effects of the symmetry energy on pion production in heavy-ion collisions at lower beam energies.

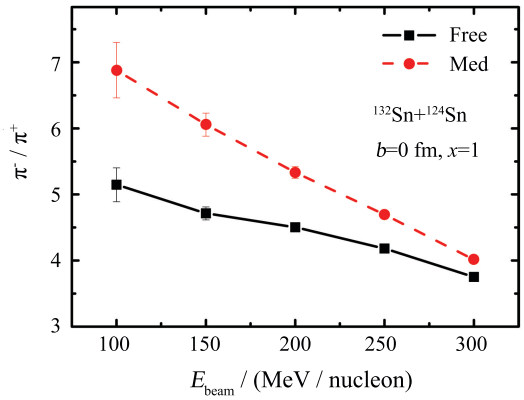

Fig. 1 (color online) Effects of in-medium NN elastic scattering cross section on the π^-/π^+ ratio in central collision ^{132}Sn+^{124}Sn at E_{beam}=100, 150, 200, 250, and 300 MeV/nucleon, respectively.

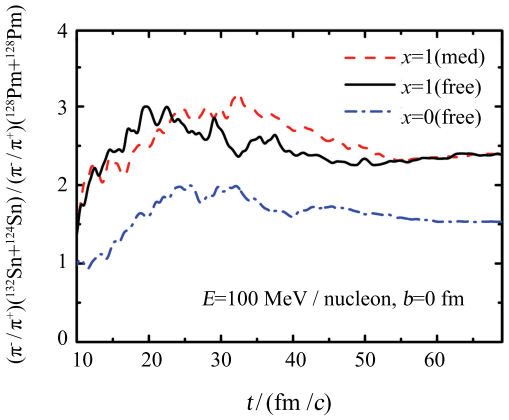

Fig. 2 (color online) Effects of medium and symmetry energy on the double π^-/π^+ ratio from ^{132}Sn+^{124}Sn and ^{128}Pm+^{128}Pm at the beam energy of 100 MeV/nucleon.

As shown in Fig. 2, we find that the effects of in-medium NN elastic scattering cross section can be almost fully cancelled out in the double ratio of π^-/π^+ from neutron-rich and neutron-poor reaction systems (with the same mass number of system) ^{132}Sn+^{124}Sn and ^{128}Pm+^{128}Pm, while the effect of symmetry energy remains alomst unchanged. The double ratio of π^-/π^+ from reaction systems of neutron rich and neutron poor of same isotopes can not fully cancel out the effects of in-medium NN cross section[2]. These studies become possible at facilities that offer fast radioactive beams, such as NSCL and FRIB in the US, FAIR in Germany, HIAF in China, or RIBF in Japan.

References

[1] W. M. Guo, G. C. Yong, W. Zuo, et al., Physical Review C, 90(2014)044605.

[2] W. M. Guo, G. C. Yong, Y. J. Wang, et al., Physical Review C, 73(2006)034603.

* Foundation item: National Natural Science Foundation of China (11375239,11435014)