Strangeness production in antiproton-nucleus annihilation

Alexei Larionov[(a,b)], Theodoros Gaitanos[(a)], Ulrich Mosel[(a)]

[(a)] Institut für Theoretische Physik, Universität Giessen, Germany
[(b)] National Research Center "Kurchatov Institute", Moscow, Russia

Even at rest, the $\bar{p}$ annihilation in a nucleus leads to a large energy deposition $\sim 2m_N$ in a relatively small volume $\sim 4 - 30$ fm^3. This leads to the formation of a local piece of strongly excited matter. The studies of particle production in $\bar{p}$-nucleus annihilation are, therefore, complementary to the similar studies in heavy-ion collisions. In fact, the interest to strangeness production in $\bar{p}$-nucleus interactions was originally related to the mechanism of strangeness enhancement in a quark-gluon plasma (QGP) and the hypothetic scenario of the transition to the supercooled QGP phase in $\bar{p}^{181}$Ta interactions at 4 GeV/c [1]. In view of the future PANDA experiment at FAIR, we present our recent results of the microscopic transport calculations of the $\bar{p}$-nucleus interactions within the Giessen Boltzmann-Uehling-Uhlenbeck model [2,3]. The gross features of the experimental data on inclusive K_S^0 and Λ production can be explained within a usual hadronic picture without need of exotic scenaria. We study in-detail the hadronic "chemistry" underlying hyperon and kaon production. The dominating mechanism of the hyperon production is the strangeness exchange processes of the kind $\bar{K}N \to Y\pi$ or $\bar{K}N \to \Xi K$. The calculated rapidity spectra of Ξ hyperons are significantly shifted to forward rapidities with respect to the spectra of the $S = -1$ hyperons. This prediction follows from the pure hadronic scenario. We argue that the QGP scenario should lead to the different result, i.e. to the similar peak positions of the rapidity spectra of all hyperon species. Thus this observable should be a sensitive test for the possible exotic mechanisms of $\bar{p}$-nucleus annihilation. We present our predictions for the Ξ hyperon and (double) hypernuclei production in $\bar{p}$-nucleus interactions at 3-20 GeV/c, including the Ξ^- interaction with a secondary target.

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E-mail: Alexei.Larionov@theo.physik.uni-giessen.de