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# The role of small hard-core radius of (anti-)Lambda-hyperons in resolving the puzzle of (anti-)hyper-triton production in high energy nuclear collisions

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We present a summary of the results obtained with the novel hadron resonance gas model based on the induced surface tension equation of state [1] with the multicomponent hard-core repulsion. This model is used to resolve the long-standing problem to describe the light nuclear cluster multiplicities including the hyper-triton nucleus measured by the STAR Collaboration, known as the hyper-triton chemical freeze-out puzzle [2]. Here we discuss an entirely new strategy to analyse the experimental data on light nuclear clusters and employing it in the analysis of hadronic and light (anti-)(hyper-)nuclei multiplicities measured by the STAR Collaboration at the center-of-mass collision energy $\sqrt{s_{NN}} = 200$ GeV and by the ALICE Collaboration at $\sqrt{s_{NN}} = 2.76$ TeV. We got rid of the existing ambiguity in the description of light (anti-)(hyper-)nuclei data and determined the chemical freeze-out parameters of nuclei with high accuracy and confidence. This success is achieved by taking into account the correct excluded volumes of light nuclei in hadronic medium and by using the small value of the hard-core radius of the $\Lambda/\bar{\Lambda}$ hyperons found in earlier work [1].
One of the most striking results is that for the most probable scenario of chemical freeze-out for the STAR energy the obtained parameters allow us to reproduce the multiplicities of hadrons and light (anti-)(hyper-)nuclei and, for the first time, to simultaneously describe the values of the experimental ratios $S_3$ and $\bar{S}_3$ which were not included in the fit. Our results show that the multiplicities of light nuclear clusters may be frozen prior to the hadrons at temperatures about $170 - 175$ MeV.
The new presented strategy allows one to determine the hard-core radii of other hyperons with high accuracy, if the yields of their hyper-nuclei are known.

References:
[1] K. A. Bugaev et al., Nucl. Phys. A 970, (2018) 133–155.
[2] O. V. Vitiuk et al., Eur. Phys. J. A 57, (2021) 74 1-12.

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