LIGHT CLUSTER PRODUCTION AT NICA*

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Measuring abundances and flow of light clusters as "rare probes" in future heavy-ion collision experiments at NICA and FAIR energies would provide unique insights into the QCD phase diagram.

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In a recent publication [1], we discussed the insights that light nuclear clusters can provide for the QCD phase diagram shown in Fig. 1, in particular within the NICA program, providing fixed target (BM@N) and collider (MPD) experiments. This diagram includes lines for Mott dissociation [2] of deuterons (d), tritons (t) and alpha particles (α), taken from [3], together with the parametrization of the chemical freeze-out line [4]. The chiral and deconfinement lines are from [5] based on a local NJL model and the DD2 equation of state [6]. The nonlocal PNJL extension [7] has a critical endpoint at a location supporting the conjecture of a tricritical point due to a quarkyonic matter phase [8]. The projection of its location to the freezeout line at $E_{\rm lab} = 15$–$25\,A\,$MeV ($\sqrt{s_{NN}} = 5.6$–7.1 GeV) coincides with a dip in the slope of the directed flow of protons and light clusters [1]. At higher energies, the expectations from the law of mass action [9] are confirmed well by the ALICE experiment [10] whereas at lower energies, the expected strong modifications due to the Mott effect for light clusters [1–3] shall be observed, *e.g.*, in the NICA experiment.

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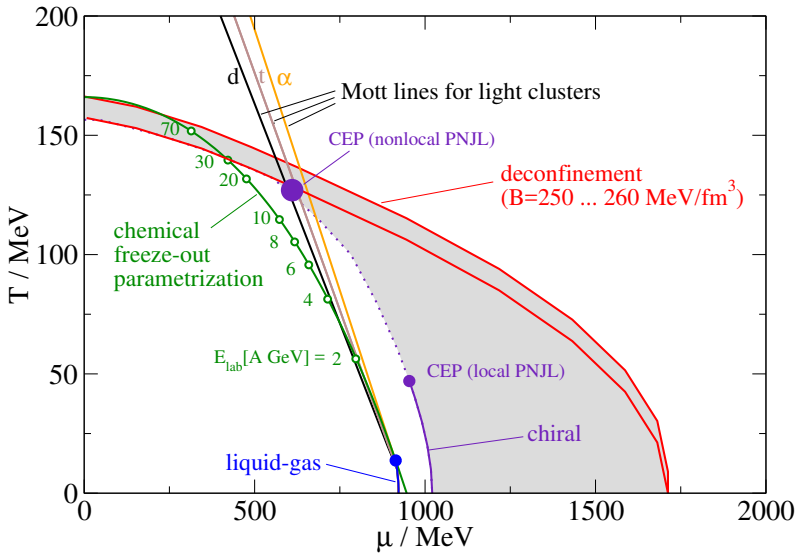


Fig. 1. QCD phase diagram with chemical freezeout [4] and Mott lines for the dissociation of light nuclear clusters [2,3]. For details, see [1,5].

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