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Inverse magnetic catalysis and energy loss in a holographic QCD model

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In this paper, we consider the Einstein-Maxwell-dilaton holographic model for light quarks with nonzero magnetic field and chemical potential. First, we study the phase diagrams in $T-\mu$ and $T-B$ planes. We observe inverse magnetic catalysis which is consistent with the lattice QCD results. We discuss the influence of the magnetic field and chemical potential on the location of the critical end point (CEP). It is found that the magnetic field increases the critical μ_{CEP} of the CEP in the $T-\mu$ plane and the chemical potential increases the critical B_{CEP} of the CEP in the $T-B$ plane. Second, we discuss the equations of state (EOS) with nonzero magnetic field and chemical potential. We observe that the EOS near the phase transition temperature are nonmonotonic. Then we study the energy loss with a nonzero magnetic field and chemical potential. It is found that the drag force of the heavy quark and jet quenching parameter $\hat{q}$ show an enhancement near the phase transition temperature. The peak values of drag force and $\hat{q}$ are pushed toward lower temperature with increasing B or μ. This phenomenon is consistent with the phase transition temperature decrease with increasing B or μ in this holographic model. Moreover, we find that the heavy quark may lose more energy when it is perpendicular to a magnetic field which is consistent with the results of the jet quenching parameter.

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