POSSIBLE FORMATION OF HIGH TEMPERATURE SUPERCONDUCTOR AT EARLY STAGE OF HEAVY-ION COLLISIONS

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We investigate the effect of the inverse magnetic catalysis (IMC) on the charged ρ meson condensation at finite temperature in the framework of the Nambu–Jona-Lasinio model, where mesons are calculated to the leading order of $1/N_C$ expansion by summing up infinity quark-loops. IMC for chiral condensate has been considered in three different ways, i.e. fitting Lattice data, using the running coupling constant and introducing the chiral chemical potential, respectively. It is observed that, with no IMC effect included, the critical magnetic field eB_C for charged ρ condensation increases monotonically with the temperature. However, including IMC substantially affects the polarized charged ρ condensation around the critical temperature T_C of chiral phase transition, the critical magnetic field eB_C for charged ρ condensation decreases with the temperature firstly, reaches to a minimum value around T_C, then increases with the temperature. Our calculation indicates that the charged ρ condensation can exist in the temperature region of $1 - 1.5T_C$ with critical magnetic field $eB_C \sim 0.15 - 0.3\text{GeV}^2$, which suggests that high temperature superconductor might be created through non-central heavy ion collisions at LHC energies. We also show that a growing electric conductivity in early stage of non-central heavy-ion collisions substantially delays the decay of strong magnetic field, which is helpful for the formation of the high temperature superconductor.