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Phase competition and large residual entropy in the pyrochlore double-exchange system YUKITOSHI MOTOME, University of Tokyo, NOBUO FURUKAWA, Aoyama Gakuin University, ERATO-MF — Strong interplay between spin and charge degrees of freedom gives rise to fascinating phenomena, in particular when the system undergoes severe geometrical frustration, such as anomalous magneto-transport and heavy-mass behavior. We investigate this intriguing problem in the double-exchange model on the frustrated pyrochlore lattice by employing an unbiased Mote Carlo simulation. We find that as increasing the antiferromagnetic superexchange between localized moments, the ferromagnetic metallic state stabilized by the double-exchange mechanism becomes unstable, and is taken over by a paramagnetic metal in which spin correlations are strongly suppressed by the frustration. In the critical region, the system exhibits a peculiar electronic and magnetic state; the competing interactions cancel with each other, resulting in an almost temperature independent state. This indicates a large entropy remaining at low temperatures, which potentially leads to heavy mass behavior or some nontrivial symmetry breaking at a lower temperature. We also discuss the relevance to experiments in itinerant pyrochlore materials.

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