



Contribution ID: 2

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Changeover phenomenon in randomly colored Potts models

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The celebrated “standard” q -state (color) Potts model, where the ferromagnetic interaction is between nearest-neighbor spins on the square lattice, is known to change its temperature-driven phase transition, from continuous to discontinuous, at some critical integer $q_c = 4$ [1,2,3]. Renormalization group theory suggests that this result should hold for other lattices or interaction content, provided that the interaction is local. There are, however, counterexamples of models with a local interaction and $q_c < 4$ [4,5].

We [6] present a new and general hybrid Potts scheme (HPS) where q_c can be manipulated, by introducing inhomogeneity to the system. More precisely, spins are chosen at random with probabilities p and $1-p$, to be colored in q_0 and q colors, respectively, where $q_0 \leq q_c < q$. We show that, when HPS is applied to the standard model, for any allowed setup of spin numbers q_0, q there is a concentration p^* where the transition type of the model is changed.

Independently, a mean-field-like interaction HPS is studied. It is shown that p^* exists for this HPS. Exact expressions for the second order critical line in concentration-temperature parameter space, together with some other related critical properties, are derived.

[1] R.J. Baxter, *J. Phys. C: Solid State Phys.* **6**, (1973).

[2] H. Duminil-Copin, V. Sidoravicius and V. Tassion, *Commun. Math. Phys.* **349**, (2016).

[3] H. Duminil-Copin, N. Gagnebin, M. Harel, I. Manolescu and V. Tassion, *arXiv:1611.09877*, (2016).

[4] R. Tamura, S. Tanaka and M. Kawashima, *Prog. Theor. Phys.* **124**, (2010).

[5] N. Schreiber, R. Cohen, S. Haber, G. Amir and B. Barzel, *Phys. Rev. E* **100**, (2019).

[6] N. Schreiber, R. Cohen, G. Amir and S. Haber, *J. Stat. Mech.* **2022**, (2022).

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