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Phase Transitions of a Dilute O(n) Model

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Abstract: We investigate tricritical behavior of the O(n) model in two dimensions by means of transfer-matrix and finite-size scaling methods. For this purpose we consider an O(n) symmetric spin model on the honeycomb lattice with vacancies; the tricritical behavior is associated with the percolation threshold of the vacancies. The vacancies are represented by face variables on the elementary hexagons of the lattice. We apply a mapping of the spin degrees of freedom model on a non-intersecting-loop model, in which the number n of spin components assumes the role of a continuously variable parameter. This loop model serves as a suitable basis for the construction of the transfer matrix. Our results reveal the existence of a tricritical line, parametrized by n, which connects the known universality classes of the tricritical Ising model and the theta point describing the collapse of a polymer. On the other side of the Ising point, the tricritical line extends to the n=2 point describing a tricritical O(2) model.

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