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Critical Behavior Of Uniformly Uniaxial Magnets DEMETRIS NICOLAIDES, Bloomfield College — Real magnetic systems never obey rotational invariance because the lattice itself is not completely rotation-invariant. The simple case of phase transitions in a magnetic system with broken rotational symmetry, described by a single, m-component vector order parameter, with uniform uniaxial perturbation in only the first component, is a prototype example. Renormalization group theory found that this kind of magnets experience phase transition of the second order, into either the easy axis of magnetization, or that they have critical behavior analogous to an (m-1)-component spin system. The present work extends this study to cover the more complex case of two coupled, continuous, anisotropic, m-component vector order parameters, having frozen-in, uniform, uniaxial anisotropies. These anisotropies are due to nonmagnetic impurities, and affect the trial (mean-field) critical temperature of only the first component of each order parameter. The study is done with the help of a phenomenological model which considers fluctuations partially. It is shown that when both coupled vector order parameters are anisotropic, the order-disorder phase transition is always of the second order, into either the uniaxial or the (m-1)- isotropic phase. This is despite the fact that for the isotropic case of two coupled order parameters, the phase transition is a fluctuation-induced first order.

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