Disorder and critical phenomena.

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In the present paper we are discussing the influence of the fractal distribution of defects on the critical behavior of the system. Investigation of defect influence on the physical properties of crystals near phase transitions is a present-day problem of statistical physics. Theoretical approaches mainly consider single-domain crystals with a homogeneous distribution of defects in the structure. However the conditions of crystal growth generate an inhomogeneous distribution of defects [1]. For the latter case, we are able to extend the Landau-Khalatnikov equation for the order parameter and represent it in the form of a differential equation of the fractional order. With this equation solved, it is possible to define the temperature dependence of the imaginary part dielectric susceptibility and the temperature dependence of this curve’s maxima, i.e. modes that accompany phase transition. We also obtain the energy spectrum and derive the corresponding renormalization group equation, and define from its analysis the system critical indexes near the phase transition. In our analysis renormalization group equation it is possible to use as a small parameter a module of difference between the fractal dimension of the structure and the nearest integer. We have obtained explicit dependences of critical indexes on the fractal dimension of structure. We consider a case when the equation of motion for the order parameter contain at the same time influences of defects of type a random field and a random temperature and we show, that it can leads to change of distribution function from Gibbs distribution to Tsallis distribution or more the general statistics q-type [2]. We deduce and solve corresponding renormalization group equation and calculate the critical indexes of corresponding system. We show that our result allows understanding the reason of the change of temperature dependences of thermodynamic functions induced by the change of concentration of the defects widely observed in the magnetic crystals with a variable composition.