

Critical behaviour of a three-dimensional hardcore cylinders composite system

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Abstract

In this work the critical indices β , γ and ν for a three-dimensional hardcore cylinder composite system with short-range interaction has been obtained. In contrast to the 2D stick system and the 3D hard-core cylinder system, the determined critical exponents do not belong to the same universality class as the lattice percolation, although obeying to the common hyperscaling relation for a 3D system. It is observed that the value of the correlation length exponent is compatible with the predictions of the mean field theory. It is also shown that, by using the Alexander-Orbach conjecture, the relation between the conductivity and the correlation length critical exponents has a typical value for a 3D lattice system.

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