Abstract

Scattering of Radiation in a Heterogeneous Medium Near the Percolation Threshold

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One of the aspects of light scattering in a heterogeneous medium with high concentration of scatterers (randomly located spherical particles) is considered. The approach is proposed, where the influence of such parameters as an average distance between particles and the wavelength of an incident radiation on the scattering process is described within the framework of a model of randomly overlapping spheres. This approach explains a maximum of the radiation scattering for some concentrations of scattering centers, that was observed in many experimental works, by the existence of a geometrical (percolation) phase transition in the system. Position of the scattering maximum corresponds to a percolation threshold for the aforementioned model. An analogy between this scattering maximum and well-known critical scattering close to the points of phase transitions is shown. The critical exponents describing intensity of scattered radiation in the vicinity of threshold concentration are found. The proposed approach is applied to the description and optimization of heat-insulating properties of composite glass spheres-paint coating.

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