Statistical methods of the theory of multiple scattering of waves are generally used to determine the optical properties of ensembles with a random and partially ordered arrangement of particles. Much less attention is paid to structures with imperfect lattices. This talk is on the problem of light scattering by ordered particulate media with short- and long-range ordering. The method to simulate spatial arrangement of particles forming the planar crystal (PC) with an imperfect lattice is described [1]. Its applicability to calculating the transmission, reflection, and absorption coefficients of the PC in the quasicrystalline approximation of the theory of multiple scattering of waves is described. The results to optimize antireflection coatings on the glass, selective reflectors, multispectral filters [2], and solar cells [3] are presented as examples.

A number of scattering problem solutions obtained for partially ordered particulate monolayers is considered. In particular, the angular distribution of light scattered by a monolayer, small-angle light scattering [4], and transmission by a polymer dispersed liquid crystal film are outlined. The quenching effect for light directly transmitted by the monolayer and some results for the spatial optical noise of the monolayer are discussed. The adding method and transfer matrix method are used to describe light propagation in 3D particulate media. The latter was used to study ordered structures from spherical alumina particles, periodic, quasiperiodic, and aperiodic sequences of monolayers [5], to solve the inverse scattering problem for 3D photonic crystals [6].

References