MODELLING OF INCOHERENT PROPAGATION IN PERIODIC STRUCTURES

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Structures with lateral periodicity as periodic gratings, two-dimensional dot arrays, photonic crystals, periodic metamaterials or holographic structures are recently widely studied. For characterisation of these structures by variety of methods, like Mueller matrix ellipsometry, it is important to model light propagation in these structures. It is typically modelled using matrix formalisms and Rigorous coupled waves algorithm (RCWA) [1].

However, the situation becomes more complex, when incoherent processes, like propagation and depolarization in a transparent substrate or a thick layer, are present. In these scenarios the light reflection and transmission from multilayer anisotropic structure consisting of thick layers can be calculated using a recurrent matrix approach described in Ref. [2].

In this paper we propose a general method for modelling of incoherent propagation in systems with lateral periodicity. The approach is based on incoherent summation of transforming coherence matrices in a thick layer for all optical waves diffracting by the system periodicity. The calculation is based on the scattering matrix approach. The complete Mueller matrices of both specular and diffracted beams describing general anisotropy and depolarization are obtained.

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