

Optical Properties of a One Dimensional Graded Photonic Structure Based on Material Length Redistribution

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Abstract : By using the transference matrix formalism, in this work, it is presented the study of the optical properties of the 1D graded structure, constructed by multiple bi-layers of dielectric and air, considering a redistribution of the material lengths following an arithmetic progression as a function of two parameters. It is presented a factorization for the transference matrices for the graded structure, which allows the interpretation of their optical properties in terms of the properties of simpler structures. It is shown that the graded structure presents new transmission peaks, which can be controlled by the parameter values located in frequencies for which a periodic system has a photonic bandgap. This result is extended to the case of a photonic crystal for which the unitary cell is the proposed graded structure, showing new transmission bands which are due to the multiple new sub-structures present in the system. Also, for the TE polarization, it is observed transmission bands' low frequencies which present low variation of its width and position with the incidence angle. It is expected that these results could guide a route in the design of new photonic devices.

Keywords : graded, material redistribution, photonic system, transference matrix

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