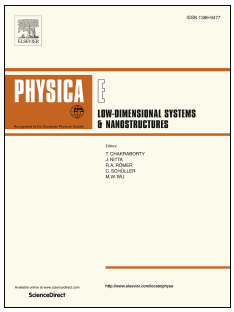
Accepted Manuscript



Optical properties of one dimensional metal-air graded system

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PII: S1386-9477(18)30922-6

DOI: 10.1016/j.physe.2018.09.013

Reference: PHYSE 13287

To appear in: *Physica E: Low-dimensional Systems and Nanostructures*

Received Date: 22 June 2018

Revised Date: 25 August 2018

Accepted Date: 14 September 2018

Please cite this article as: D.M. Calvo-Velasco, N. Porras-Montenegro, Optical properties of one dimensional metal-air graded system, *Physica E: Low-dimensional Systems and Nanostructures* (2018), doi: https://doi.org/10.1016/j.physe.2018.09.013.

Optical properties of one dimensional metal-air graded system.

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Abstract

Using the scattering matrix formalism, in this work it is presented the numerical study of the optical properties of 1D photonic graded systems, constructed by multiple bi-layers of Drude-type metal and air, where the total amount of material, as well as the length proportion of them in each bi-layer are kept constant. A graded variation of the bi-layers length, following an arithmetic progression defined in terms of a variable δ is considered. It is shown the formation of a transmission band that grows with the number of bi-layers and how the increase of the metallic plasma frequency or the size of the system modifies the transmission spectra, resembling the response of different photonic crystals. For the transverse electric (TE) and magnetic (TM) modes, it is presented the redistribution of the transmission peaks to higher frequencies as a function of the incident angle and δ. For TM mode, it is observed the appearance of maximum transmission peaks below the metallic plasma frequency, in an equal number as the air layers of the system, whose widths decrease with the augment of the incident angle. It is observed the variation of the transmission peaks with the increase of δ, which are shifted to higher frequencies, due to the material distribution which is mainly located on one side of the system. Additionally an analytical approach for graded structures is developed.

Keywords:
Graded, Photonic system, Metal

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