Journal of Modern. Optics, 45(10): 2147-2157

Impurity Modes in One-dimensional Photonic Crystals-analytic Approach

Tsai, Y. C. ; Shung, K. W. K. ; Gou, Shih-Chuan

Abstract

We investigate the impurity problem in one-dimensional photonic crystals using the two-band Bloch wave approximation. The impurity level, as the lasing mode, is described in terms of the width and the dielectric function of the impurity, which are in fair agreement with the numerical data by the transfer matrix method. The maximum field intensity and the strongest spatial localization occur when the impurity mode is at midgap, indicating large gain enhancement of the lasing mode. The threshold gain and the optimal conditions for the impurity are evaluated. Effects of surface variations are also analysed to further improve the efficiency of the lasing system.