The K．P theory in photonic crystals

Student: Chih-hsien Huang Advisor: Prof. Wen-Feng Hsieh

Institute of Electro-Optical Engineering
College of Electrical Engineering and Computer Science
National Chiao Tung University

Abstract

Using the K.P theory into photonic crystals (PCs), the photon excites an inertial mass form the periodic background. The phenomenon that the light trapped in the defect is similar to the particle trapped in the potential. Any arbitrary small defect will bind a state in 1-D defect, but a finite disorder is needed to bind a state in 2-D or 3-D defects.

When we calculate the properties of the defects, the effective inertial mass can be gotten from the experiments or the simulation results from numerical methods of bulk PCs. Introducing the parameter into two-band model of K.P theory in the heterosturcture of PCs, the envelop function and the bound state energy can be solving quite correctly no matter in 1-D PCs or 2-D PCs. The K.P method provides an analytic method to solve the Maxwell's equation in PCs, and by the method, we can predict and explain the trapping phenomenon of the PCs with defect whereas other numerical simulation methods just can tell us just a simulation result.