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摘要(中)	近年來，光子晶體引起大量興趣與研究，在材料工程方面，有人提出電磁輻射可被周遭環境改變。這些環境包括金屬共振腔(metallic cavities)、介電質共振腔(dielectric cavities)，和光子晶體(photonic crystals)，控制材料的光學性質變成主要研究問題；其中一項應用就是:當因自發性輻射(spontaneous emission) 產生的能量消散被抑制時，可提升增強雷射振盪的發生。而光子態密度(photon density of states)是與費米黃金規則(Fermi golden rule)的躍遷機率有關。其中，光子晶體是用來改變環境光子態密度的好材料。在本文，我們研究一維的光子晶體：包括在波導管中的多層介電質與傳統多層膜，推導計算其能帶結構(Band structure)與光子態密

	度，並且計算 ATR 曲線，此對研究近場光學亦有幫助。我們嘗試使用 FEMLAB 與 MATLAB 來計算二維及三維的光子晶體；現在，我們已經得到二維光子晶體的初步結果，這些計算結果以和其他方法獲得的結果比較，有很好的一致性。未來，我們會完成三維光子晶體的計算。 關鍵詞:光子晶體、金屬共振腔、介電質共振腔、自發性幅射、 光子態密度、能帶結構、ATR
摘要(英)	Photonic crystals have attracted much attention in recent years. To control the optical properties of materials has become a key issue in material engineering. It was proposed that the emission of electromagnetic radiation can be modified by the environment. Several environments such as metallic cavities, dielectric cavities, and photonic crystals had been studied. One of the applications is that the occurrence of laser oscillations can be enhanced if the energy dissipation due to the spontaneous emission can be suppressed. In the case of photonic crystals, the environmental effects can be described by the photon density of states (PDOS). The PDOS is related to the transition rate of Fermi golden rule. In this thesis, we investigate the band structures and photon density of states of one-dimensional photonic crystals including a quasi-one-dimensional multilayer heterostructure in a rectangular waveguide and a traditional multilayer film. In addition, we calculate the ATR curves that are useful for studying near field optics. We have tried to solve the band structures and PDOS of 2D and 3D photonic crystals using FEMLAB with MATLAB. Here, some preliminary results of 2D photonic crystals have been presented. Our simulation results have been checked in comparisons with that calculated by other methods, giving good agreement. In the future, we will complete the calculations of 3D photonic crystals. Key words: photonic crystals, metallic cavities, dielectric cavities, spontaneous emission, photon density of states, band structures, and ATR.
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