ANALYSIS OF TRANSMISSION PROPERTIES IN A PHOTONIC QUANTUM WELL CONTAINING SUPERCONDUCTING MATERIALS

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Abstract

|Properties of wave transmission in a photonic quantum well (PQW) structure containing superconducting materials are theoretically investigated. We consider two possible PQW structures, (AB)P (CD)Q(AB)P -asymmetric and (AB)P (CD)Q(BA)P -symmetric, where the host photonic crystal (PC) (AB)P is made of dielectrics, A = SrTiO3, B = Al2O3, and the PQW (CD)Q contains C = A and superconducting layer D = YBa2Cu3O7¡x, a typical high-temperature superconducting thin ¯lm. Multiple transmission peaks can be seen within the photonic band gap (PBG) of (AB)P and the number of peaks is directly determined by the stack number of PQW, i.e., it equals Q-1. Additionally, the results show that symmetric PQW structure is preferable to the design of a multichannel transmission ¯lter. The e®ect of stack number of photonic barrier is also illustrated. Such a ¯lter operating at terahertz with feature of multiple channels is of technical use in superconducting optoelectronic applications.

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