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Title:A dual-frequency orthogonal-bi-polarization laser cavity based on a photonic crystal

Authors:Ouyang, Zheng-Biao (1); Cao, En-Wen (1); Li, Cheng-Kuan (1)

Author affiliation:(1) Shenzhen Key Lab. of Micro-Nano Photonic Information Technology, College of Electronic Science and Technology, THz Technical Research Center of Shenzhen University, Shenzhen 518060, China

Corresponding author:Ouyang, Z.-B.(zbouyang@szu.edu.cn)

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Abstract:With an anisotropic defect layer in a one-dimensional photonic crystal, a dual-frequency orthogonal-bi-polarization laser cavity is presented. It is demonstrated through 4×4 transfer matrix method that such a cavity does have two orthogonally polarized resonance modes. The frequency difference of the two modes can be efficiently controlled by rotating the optical axis of the anisotropic defect layer in the cavity. The condition for maintaining the two modes to exist simultaneously is to have approximately an equal optical gain for both of the two modes in the active cavity. It is found that equal optical gain for the two modes can be obtained by controlling the concentration of gain material in the defect layer in the active cavity. The influences of the orientation of optical axis and the number of periods around the defect layer on operating parameters in the active cavity are also studied. Such a cavity is different from conventional ones for its small size with thickness in a few micrometers and large tunable frequency difference from 0 to 199.8 GHz.