Switchable lasing in multimode coupled photonic microcavities

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Single-mode switchable lasing in multimode coupled microcavity resonators is theoretically investigated. We have shown analytically that such a resonator tends to multistability, allowing a deterministic injection seeding at the onset of lasing to influence the mode competition and cause lasing into each mode on demand. We consider twin coupled point defects in a 2D photonic crystal lattice and coupled nanopillar waveguides [1] (similar to nanowire array lasers [2]). Picosecond seeding pulses are numerically shown to cause mode selection as well as live mode-to-mode switching on a sub-nanosecond time scale in both structures. The results suggest another concept of multiple-wavelength microlaser design allowing all-optical wavelength switching alternative to externally exerted microcavity tuning. The nanopillar structures are within the current state-of-the-art fabrication possibilities [3].

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