Ultra low threshold room temperature lasing on photonic crystal microcavities with quantum wires

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Room temperature (RT) lasing in photonic crystal microcavities has been demonstrated around 1.3μm using five stacked self-assembled InAs QD layers as active material [1-2]. Bordas *et al* recently reported a compact photonic crystal microlaser at RT with a single plane of InAs/InP quantum dots as gain medium [3]. Baba et al [4] showed RT lasing at 1.5 μm on quantum wells on InP with thresholds around 1.2 μW of effective pump power and Q=20000. Finally, a value of Q up to 28000 was reported by Frédérick *et al* [5] on InP- PC microcavities. In this work we show, for the first time, room temperature lasing at 1.5 μm in photonic crystal microcavities with a single layer of self-assembled quantum wires. Ultra low threshold values around 10 μW have been measured, along record quality factors exceeding Q=55000 using L7-type photonic crystal microcavities. Solid-source molecular beam epitaxy has been used for the synthesis of the InP/InAs epitaxial material comprising a single layer of InAs QWRs [6]. Fabrication procedure relies on electron-beam lithography and reactive ion beam etching techniques [7]. The main axis of the cavity is always parallel to the QWRs, which grow along the [1-10] direction. No lasing has been obtained for L7 cavities with axis parallel to the [110] (i.e., perpendicular to the direction of the QWRs). This shows the strong one-dimensional character of the QWRs inside the photonic cavity.

References

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