Part II

Fiber-Coupled Microdisk Cavities with Embedded Quantum Dots

The second part of this thesis studies the properties of AlGaAs microdisk cavities containing an integral layer of self-assembled InAs quantum dots. Chapter 5 presents initial measurements of high quality factors within 4.5 μm diameter disks, as well as photoluminescence measurements of the devices. Chapter 6 examines the use of the fiber taper within photoluminescence measurements of the cavities, to create fiber-coupled microdisk lasers with high differential efficiencies. Chapter 7 extends the work of the previous chapters to consider small diameter ($D \sim 2$ μm) disks with high quality factors, small mode volumes, and very low threshold powers. For cavity QED experiments, the most important results from these chapters are that the demonstrated microdisk cavities have the requisite combination of Q and V_{eff} for strong coupling to a single QD, and the fiber coupling technique provides an important tool that can enable future generations of experiments. Chapter 8 considers a first set of such experiments in detail, and in particular, presents quantum master equation simulations of the expected behavior of these devices.