Abstract Submitted
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Fiber-based spectroscopy of 1.55 μm PbS Quantum Dots coupled to Si Microcavities MATTHEW RAKHER, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, RANOJOY BOSE, CHEE WEI WONG, Center for Integrated Science and Engineering, Solid-State Science and Engineering and Mechanical Engineering, Columbia University, KARTIK SRINIVASAN, Center for Nanoscale Science and Technology, National Institute of Standards and Technology — The development of an emitter with atom-like properties in the telecommunications band that can be integrated with Si photonics has many implications for optical communication and quantum information science. In these areas, efficient collection of the optical signal is of the utmost importance, nowhere more so than for low-light levels in the near-infrared. Towards that end, we use an optical fiber-taper waveguide to probe near-infrared PbS quantum dots (QDs) solution deposited onto Si photonic crystal cavities, Si microdisks, and the taper itself. We show that the tapered fiber can be used to excite the QDs and efficiently collect the subsequent photoluminescence (PL). Furthermore, we show how the many modes of a microdisk can be exploited to provide both efficient pump and collection channels enabling time-resolved PL measurements of a few QDs. Finally, we show how the tapered fiber can be used in and of itself as a convenient means to pump and collect PL at 30 K and room temperature. This work should enable single particle spectroscopy with near-infrared colloidal QDs.

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