Temperature Control the Ptoton-Exciton Coupling for a Quantum Dot Embedded In Pillar Microcavity

Jian Lu[1], Qijun Ren[1], H. Tan[2], Shan Wu[3], Liaoxin Sun[1], Hongxing Dong[1], Weihang Zhou[1], Wei Xie[1], Yanjing Lin[1], C.Jagadish[2], Xuechu Shen[1] and Zhanghai Chen[1]

[1]*Surface Physics Laboratory, Department of Physics, Fudan University, Shanghai, 200433, China*

[2]*Department of Electronic Materials Engineering, Research School of Physical Sciences and Engineering, Australian, National University, Canberra, ACT 0200, Australia*

[3]*National Laboratory of Solid State Microstructures, Nanjing University, Nanjing 210093, China*

Semiconductor microcavity that provide non-classical light states, offer unique means of controlling light-matter interactions in confined geometries and have a broad range of applications in quantum information science including single-photon sources, quantum computation and quantum communication. In recent years, cavity quantum electrodynamics (QED) effects have been studied in varieties of solid-state systems. Here, we present a direct approach for the fabrication of self-assembled Ⅲ-Ⅴ quantum dots embedded in a pillar microcavity utilizing focused ion beam (FIB) etching. By tuning the temperature to control the coupling of the quantum dots with a discrete cavity mode, we observe a considerable Purcell enhancement effect and the temperature dependent behavior of single quantum dot is also studied.