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报告

复合微腔量子电动力学

Cavity Quantum Electrodynamics in Hybrid Systems

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讲者介绍 Biography

Dr. Yun-Feng Xiao received the B.S. and Ph.D. degrees in physics from University of Science and Technology of China in 2002 and 2007, respectively. After a postdoctoral research at Washington University in St. Louis, he joined the faculty of Peking University in 2009, and was promoted a tenured professor in 2014. His research interests lie in the fields of whispering-gallery microcavity optics and photonics. He has authored or co-authored more than 150 refereed journal papers in Science, Nature Photonics, PNAS, PRL, Advanced Materials et al. He has delivered over 100 plenary/keynote/invited talks/seminars in international/national conferences/universities.

报告摘要 Abstract

Confinement and manipulation of photons using microcavities have triggered intense research interest in both fundamental and applied photonics for more than two decades. Prominent examples are ultrahigh-Q whispering gallery microcavities which confine photons by means of continuous total internal reflection along a curved and smooth surface. The long photon lifetime, strong field confinement, and in-plane emission characteristics make them promising candidates for enhancing light-matter interactions on a chip. In the first part of this talk, I will introduce some representative optical applications of ultrahigh-Q microcavities. In the second part, I will focus on cavity quantum electrodynamics in hybrid microcavities. In particular, we propose to engineer the electromagnetic environment of plasmonic resonances using an optical microcavity. By building a full-quantum analytical model, it is found that the coherent radiation is greatly enhanced in the cavity-engineered environment, thus suppressing the incoherent Ohmic loss. Further, when a single quantum emitter interacts with the cavity-engineered plasmon, we observe more than 40-fold enhancement of the quantum yield and more than one-order-of-magnitude stronger radiation power. Salient evidences like vacuum Rabi oscillation, vacuum Rabi splitting and anti-crossing indicate an entrance into strong coupling regime. The concept of cavity-engineered plasmonic modes holds great potential for quantum information processing and precise sensing, and can stimulate new insight onto plasmonic-QED.