

Ultrastrong Coupling of CdZnS/ZnS Quantum Dots and Breathing Plasmons in Aluminum Metal-Insulator-Metal Nanocavities in Near-Ultraviolet Spectrum

Authors : Li Li, Lei Wang, Chenglin Du, Mengxin Ren, Xinzheng Zhang, Wei Cai, Jingjun Xu

Abstract : Strong coupling between excitons of quantum dots and plasmons in nanocavities can be realized at room temperature due to the strong confinement of the plasmon fields, which offers building blocks for quantum information systems or ultralow-power switches and lasers. In this work, by using cathodoluminescence, ultrastrong coupling with Rabi splitting above 1 eV between breathing plasmons in Aluminum metal-insulator-metal (MIM) cavity and excited state of CdZnS/ZnS quantum dots was reported in near-UV spectrum. Analytic analysis and full-wave electromagnetic simulations provide the evidence for the strong coupling and confirm the hybridization of the QDs exciton and LSP breathing mode. This study opens the way for new emerging applications based on strongly coupled light-matter states all over the visible region down to ultraviolet frequencies.

Keywords : breathing mode, plasmonics, quantum dot, strong coupling, ultraviolet

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