Light Science & Applications

Scanning Exciton Microscopy for Imaging at the Deep Nanoscale

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The ability to map nanoscale light fields and the local density of states (LDOS) near structured-material surfaces affects fields as diverse as nanophotonics, quantum optics, spectroscopy and material science. An effective probe would be ideally a single atom. However, since to date there is still no way of manipulating a free atom near sample surfaces with nanometre accuracy, the experimental realization of this dream remains elusive, despite impressive progresses in pursuing the idea. Here we report on scanning exciton microscopy using an artificial atom, i.e. an oriented 6.6 nm colloidal quantum dot (QD), which possesses a well-defined dipole moment, single-exponential photoluminescence decay dynamics and outstanding photostability in air. We demonstrate such scanning exciton microscopy for several experimental configurations and show its unprecedented ability to simultaneously sense nanoscale light fields and LDOS with exciton-scale lateral and axial resolution.

Short Bio:

Xue-Wen Chen received his PhD degree in Optics from Zhejiang University, China. He is now professor at the School of Physics and Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China. Prof. Chen's research includes theoretical, numerical and experimental studies of deep nanoscale optics and quantum nanophotonics.