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Strong Coupling between ZnO Excitons and Localized Surface Plasmons of Silver Nanoparticles Studied by STEM-EELS[1] JIAKE WEI, JINGYUE LIU, Department of Physics, Arizona State University — We investigated the strong coupling between the excitons of ZnO nanowires (NWs) and the localized surface plasmons (LSPs) of individual Ag nanoparticles (NPs) by monochromated electron energy loss spectroscopy (EELS) in an aberration-corrected scanning transmission electron microscopy (STEM) instrument. The EELS results confirmed that the hybridization of the ZnO excitons with the LSPs of the Ag NPs created two plexcitons: the lower branch plexcitons (LPs) with a symmetrical dipole distribution and the upper branch plexcitons (UPs) with an anti-symmetrical dipole distribution. The spatial maps of the LP and UP excitations reveal the nature of the LSP-exciton interactions. When the size of the Ag NP decreases the peak energies of the LPs and UPs show a blueshift, and an anticrossing behavior at the ZnO exciton energy was observed. The coupled oscillator model can be used to understand the dispersion curve of the plexcitons and a Rabi splitting energy of ˜170 meV was deduced. The high spatial resolution monochromated STEM-EELS approach demonstrated in this work is general and can be extended to study the various coupling interactions of a plethora of metal-semiconductor nanocomposite systems.

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Jingyue Liu
Department of Physics, Arizona State University

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