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**Exciton-Plasmon Coupling in Metal-Nanoparticle-Decorated ZnO/MgO Core-Shell Nanowires** DANIEL MAYO, CLAIRE MARVINNEY, Vanderbilt University, EPHRAIM BILILIGN, North Carolina State University, JAMES MCBRIDE, Vanderbilt University, RICHARD MU, Fisk University, RICHARD HAGLUND, Vanderbilt University — Zinc oxide has emerged as one of the most promising optoelectronic materials due to its direct bandgap of 3.37 eV and large exciton binding energy of 60 meV. Room temperature photoluminescence (PL) spectra for ZnO exhibit a sharply defined exciton recombination peak centered at 3.3 eV and a broad visible defect peak centered around 2.3. A wide range of optoelectronic devices, including LEDs, lasers and sensors, have been developed by tuning ZnO emission through different growth, annealing, and doping conditions. However, one of the most effective methods for PL enhancement is through coupling of localized surface plasmons of metal nanoparticles to the ZnO luminescent centers. ZnO nanowires are decorated variously with Ag, Al, and Au nanoparticles, with an insulating MgO interlayer used to differentiate plasmon-mediated emission due to hot-electron transfer from that due to local field effects. In addition, at specific MgO thicknesses, Fabry-Perot resonators within the core-shell nanowires result in dramatic enhancement of the band-edge PL while the visible emission remains unaffected. A large variation in the band-edge emission occurs for the various nanoparticle species, with Al exhibiting the strongest plasmonic coupling and therefore the highest PL enhancement.

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