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Highly enhanced green emission of ZnO via plasmonic resonance of a tungsten tip HUIQI GONG, XIAODONG GUO, LI DONG, Beijing National Laboratory for Condensed-Matter Physics and Institute of Physics, Chinese Academy of Sciences, NAN XIE, Photonics Center, College of Physics Science, Nankai University, SHICHAO YAN, XINYAN SHAN, YANG GUO, JIMIN ZHAO, Beijing National Laboratory for Condensed-Matter Physics and Institute of Physics, Chinese Academy of Sciences, QIAN SUN, Photonics Center, College of Physics Science, Nankai University, XINGHUA LU, Beijing National Laboratory for Condensed-Matter Physics and Institute of Physics, Chinese Academy of Sciences — We present a systematic investigation of the photoluminescence of a single crystal ZnO with the aid of a metallic tungsten tip in a pulse laser assisted scanning tunneling microscope. When excited with 740nm laser pulses and as the tip approaches ZnO surface up to the tunneling region ($\sim$ 1nm), an enhancement in green emission (centered at 560nm), up to a factor of 70, is observed. The photoluminescence is a two-photon excitation process, which is evident by the observation of the second-harmonic peak of excitation light and the up-converted luminescence. By measuring the green emission intensity as a function of incidence power, wavelength, and tip-sample distance, we illustrate the critical role of plasmonic resonance of the tungsten tip for the enhanced green emission. The observed broad plasmonic response (680nm to 1080nm) implies possible applications in designing novel solar cells with the aid of tungsten plasmon.

Xiaodong Guo
Beijing National Laboratory for Condensed-Matter Physics and
Institute of Physics, Chinese Academy of Sciences

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