

Abstract Submitted  
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**A single-wavefunction density functional approach to the plasmonic nanostructures in the extreme quantum limit**<sup>1</sup> DAFEI JIN, FAN WANG, NICHOLAS FANG, Massachusetts Inst of Tech-MIT — We have constructed a single-wavefunction density functional model, which can reproduce the key physical properties of silver, such as its work function, exchange-correlation energy, bulk and surface plasmon frequencies. We apply this model to the studies of silver thin films, nanowires, and silver-dielectric indefinite metamaterials, at the length scale from subnanometers to tens of nanometers. We find that the quantum kinetics of electrons in silver can cause a large nonlocal dependence and blueshift of surface plasmon frequency, when the plasmonic wavelength and the typical size of structures become smaller than 50 nm. Our calculated results can be used to explain the spectrum broadening phenomena observed in recent cathodoluminescence and electron energy loss spectroscopy experiments.

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