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**Vacancy Scanning Tunneling Spectroscopy of Ag (111)** DANDA P. ACHARYA, Ohio University, KAI-F. BRAUN, Ohio University, SAW-WAI HLA, Ohio university — We investigate the vacancy electronic structures on a Ag(111) surface at 4.6 K by using scanning-tunneling-microscopy (STM) manipulation and spectroscopy in an ultra-high-vacuum environment. The vacancies with single atom to over a hundred-atom sizes are created on atomically cleaned Ag(111) surface by controlled tip-sample contact and single atom manipulation. Conductance tunneling spectroscopy data are then acquired by using a lock-in amplifier attached to the STM. The shift of the on-set of Ag(111) surface state is observed in few-atom vacancies. For the larger vacancies, we are able to probe the bulk silver unoccupied s-p band using tunneling spectroscopy. This experiment demonstrates a unique capability of a combined STM manipulation and spectroscopy to probe bulk and surface properties of materials through engineered atom and nanoscale cavities. This work is financially supported by a US-DOE grant, DE-FG02-02ER46012, and a NSF-NIRT grant, DMR-0304314.

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