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Molecular Scale Imaging with A Smooth Superlens NICHOLAS FANG, University of Illinois, PRATIK CHATURVEDI, UIUC, WEI WU, HPLabs, VIJAY LOGEESWARAN, UC Davis, ZHAONING YU, YI XIONG, SAIF ISLAM, SHIH-YUAN WANG, XIANG ZHANG, UIUC TEAM, HP LABS TEAM, BERKELEY COLLABORATION, UC DAVIS COLLABORATION — Recent theory suggested a novel approach of optical imaging with resolution far beyond the diffraction limit. This can be done simply by exciting quasi-static surface plasmons of a thin silver film, allowing the recovery of evanescent waves in the near field image. Resolution as high as 60 nanometers or 1/6 of wavelength has been achieved experimentally. This unique optical superlens will enable parallel imaging and nanofabrication in a single snapshot, a feat that are not yet available with other nanoscale imaging techniques such as atomic force microscope or scanning electron microscope. In this paper, we demonstrate that such image resolution can be further refined through the use a multilayer superlens. Applying the state-of-the-art nanoimprint technology and surfactant mediated growth of silver film, we show that a smooth superlens can be fabricated with thickness down to 15nm. With optimized design of multilayer superlens (working wavelength of 380 nm), our experimental and numerical results both indicate the feasibility of resolving features of 30nm and below. The development of potential low-loss and high resolution superlens opens the door to exciting applications in nanoscale optical metrology and nanomanufacturing.

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