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**Structures of $\sim 100$ nm Size Produced by Atom Lithography with Metastable He**[1] JASON REEVES, CHRISTOPHER CORDER, XIAOXU LU, CLAIRE ALLRED[2], HAROLD METCALF, Stony Brook University, Stony Brook, NY 11794-3800 — We have used neutral atom lithography with metastable $2^3$S He (He*) to produce structures of size $\sim 100$ nm. A beam of He* from our source is collimated by the bichromatic force[3] and then by optical molasses. Atoms cross a standing wave of $\lambda = 389$ nm light tuned $\sim$80 MHz below the $2^3S_1 \rightarrow 3^3P_2$ transition and are focussed into lines striking a self assembled monolayer (SAM) of nonanethiol coated over a gold film on a single crystal Si wafer. The 20 eV internal energy of He* destroys the SAM molecules ultimately leaving a pattern of SAM on the gold. Subsequent etching of the unprotected region of the gold results in these features[4,5]. The lines are separated by 194.5 nm and they occupy about 60% of their spacing. AFM measurements of our first samples show their width to be $\sim 120$ nm and their depth to be $\sim 10$ nm.

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