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Laser induced patterning of metal films via weakly bound layers on surfaces MICHA ASSCHER, ORI STEIN, YIGAL LILACH, The Hebrew University of Jerusalem, LEONID V. ZHIGILEI, ZHIBIN LIN, University of Virginia, Charlottesville — Pulsed laser heating of weakly bound layers has been employed for selective removal of these layers. The ablated films (Xe) are then used as templates for metallic clusters and film patterning. The method enables patterning over most substrates that absorb the laser light, e.g. Ru(001) single crystal, soft surfaces prepared from self assembled monolayers (SAM) and SiO_2/Si(100). Patterns obtained from interfering laser beams result in a ratio of laser wavelength to width of pattern's edge less than 1:40, better than most standard optical, mask-less patterning techniques. In-situ optical diffraction has been utilized to study the thermal stability of the patterned weakly bound films against surface diffusivity and desorption. Molecular Dynamics simulations of a Xe film composed of 15,000 atoms attached in 14 layers, has demonstrated a threshold for ablation at $100 J/m^2$. At identical laser energy above threshold and 3-10 psec pulse duration range, longer pulses result in better patterning resolution.

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