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Plasma-formed hyperthermal atomic beams for use in thin film fabrication[1] E.P. GILSON, S.A. COHEN, B. BERLINGER, Princeton Plasma Physics Laboratory, W. CHAN, SRI International — Enhancing the surface mobility of adsorbents during thin-film growth processes is important for creating certain high-quality thin films. Under the auspices of a DARPA program to develop methods for supplying momentum to adsorbates during thin-film formation without using bulk heating, a hyperthermal atomic beam (HAB) was generated and directed at silicon surfaces with patterned coatings of pentacene, gold, and other surrogates for adsorbents relevant to various thin-film coatings. The HAB was created when the plasma from a helicon plasma source struck a tungsten neutralizer plate and was reflected as neutrals. Time averaged HAB fluxes 100 times greater than in previous PPPL HAB sources have been generated. The effect of the HAB on the patterned coatings was measured using atomic force microscopy (AFM). Results are presented on the flux and energy of the HAB for various system pressures, magnetic fields, and neutralizer biases. AFM measurements of the surface topology demonstrate that the HAB energy, species, and integrated flux are all important factors in altering surface mobility.

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