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Tip-induced Nanopatterning of Ultrathin Polymer Brushes

With atomic force microscopy (AFM), we investigate the high-resolution patterning of 2 nm thick vinyl-terminated polystyrene-(PS)-brushes. We evaluate line broadening due to tip degradation and compare the structuring properties directly with those of a silane-based fluorinated self-assembled monolayers (SAMs) using 2-nm-thick molecular hetero patterns generated with Polymer Blend Lithography (PBL).

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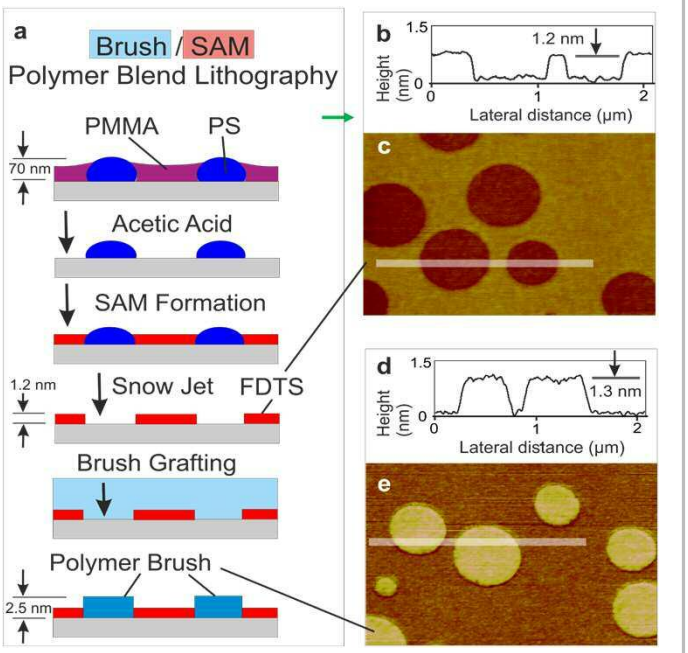
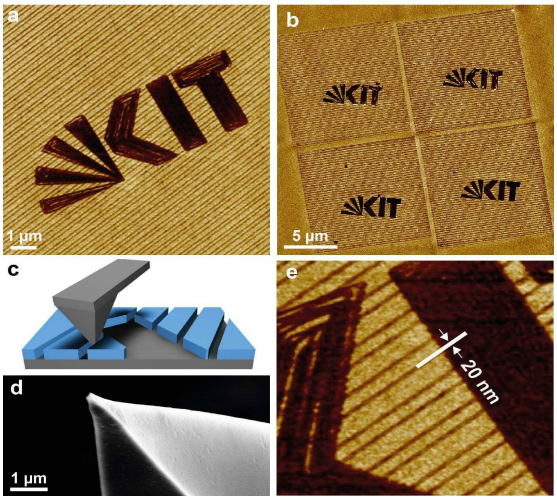
Polymer Blend Lithography for Patterned SAM/Brush Model Surfaces (2 nm Topo)



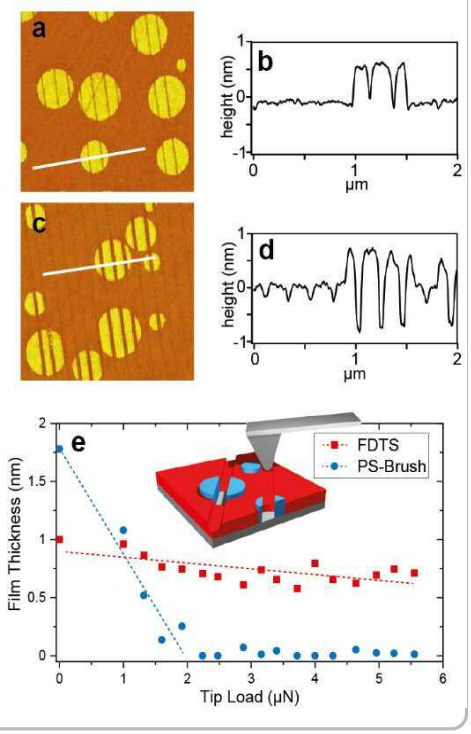
Patterning ultrathin Polymer Brushes → 5000-fold increased tip life (vs. SiO_X)



AFM topography with a z-range of 3 nm. Brush molecules were removed by applying a normal force of 1 µN to the tip of the AFM, No broadening of the linewidth of 20 nm (FWHM) was observable within the accuracy of the measurement.

Force - Dependence

Nanoshaving of PS-brush and FDTS-SAM was directly compared: PS-brush was completely re-moved from the SiOx surface (2µN), (blue dots in e), while the FDTS-SAM was still stable at maximum loads of 5.5 µN (red dots in e).



Directed Self-Assembly of PS-P_2VP Polymer Blends