TiO_2 Area-Selective Deposition: Using Selectivity Loss Mechanisms to Advance Applications in Nanopatterns and EUV Resist Materials – Supplementary Document

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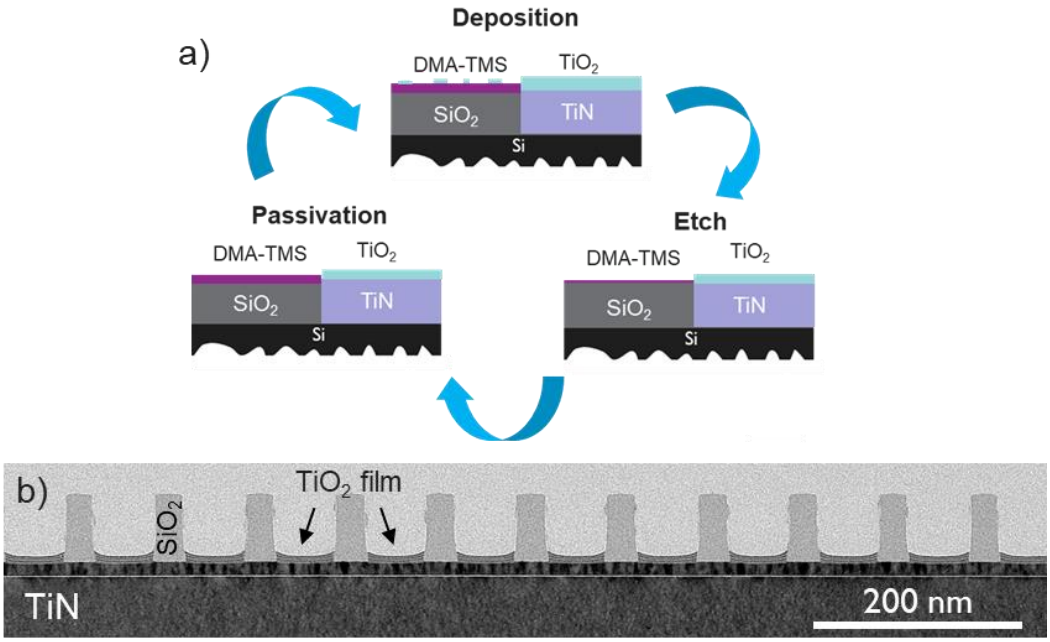

Figure 1: (a) Schematic of TiO_2 ASD process developed herein utilizing cyclical surface passivation, deposition, and etch steps. (b) Transmission electron microscopy (TEM) images on 45 nm half-pitch SiO_2/TiN line/space patterns after three super-cycles of DMA-TMS passivation, 75 cy TiO_2 ALD, and 45 s plasma etch (total 225 cy ALD). Results show a conformal TiO_2 film on the TiN substrate without significant defectivity on the SiO_2 sidewalls or top surfaces and good consistency across the pattern.

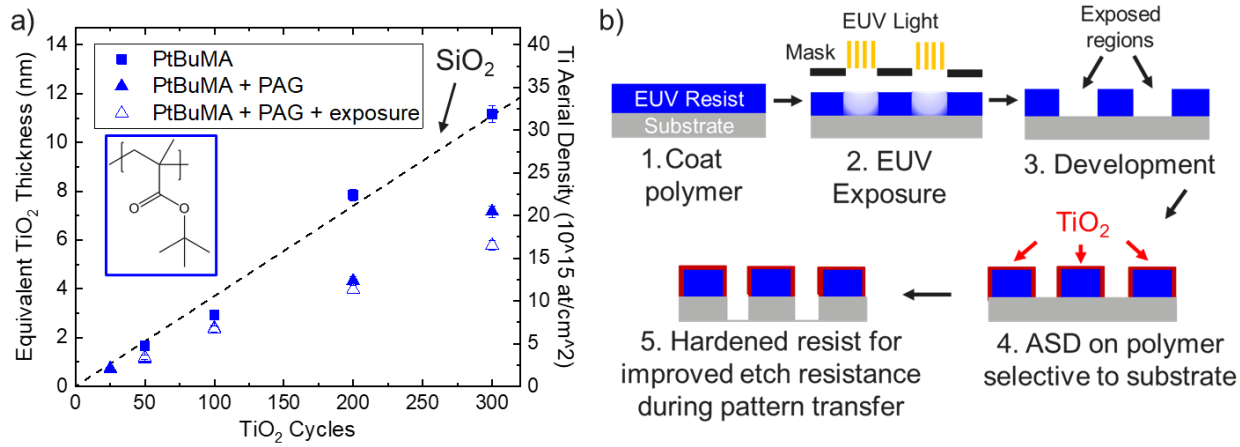

Figure 2: (a) RBS results showing Ti content (right y-axis) and equivalent TiO_2 film thickness (left y-axis) after TiO_2 ALD ($TiCl_4$/H_2O at 125 °C) on poly(*tert*-butyl methacrylate) (PtBuMA) resist materials: the PtBuMA homopolymer (squares), PtBuMA + photo-acid generator (PAG, filled triangles), and PtBuMA+PAG after EUV exposure (hollow triangles). TiO_2 deposition occurs at the same rate on the polymer with PAG before and after exposure, making this resist material suitable for resist hardening applications, as shown schematically in (b). After resist exposure and development, ASD of TiO_2 is performed on the remaining resist to improve etch resistance and thus resolution during pattern transfer.