

Wet-etching of structures with straight facets and adjustable taper into glass substrates†

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ELECTRONIC SUPPLEMENTARY INFORMATION

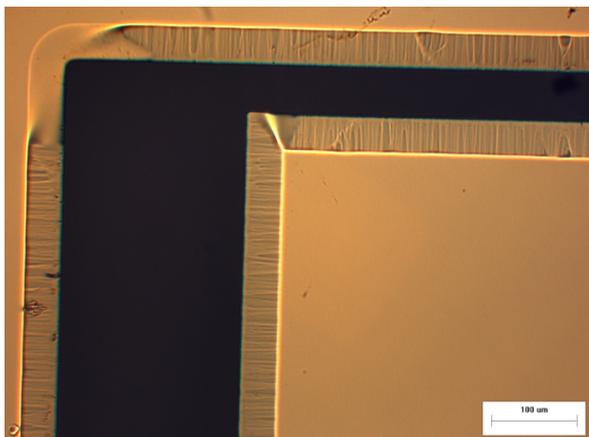


Fig. S1. Epi-illumination microphotograph of a gold overhang covering the edges of etched features after the etch step and prior to the removal of the etch mask. The overhanging material has collapsed against the glass due to Young-Laplace pressure when the die was dried. The etch mask comprised a 10-nm layer of Ti, 200-nm layer of Au, and 1.4 μm layer of positive photoresist.

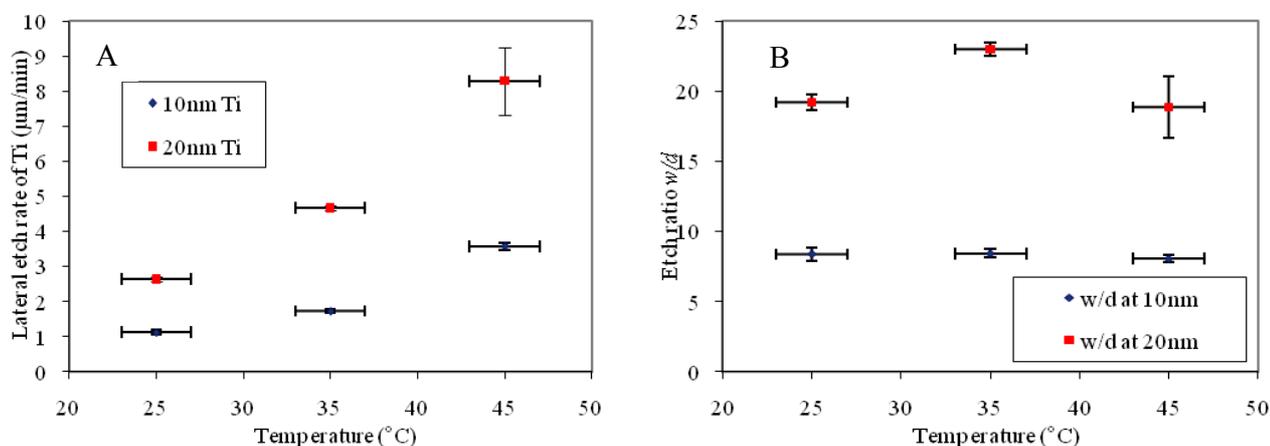


Fig. S2. Effect of temperature on etch kinetics. The ultrasound power setting was set at 20%, and temperature was maintained within 2 $^{\circ}\text{C}$ from the reported value. Error bars represent two propagated standard deviations for ten data points collected across each die. (A) Variation of lateral etch rate of the Ti film with temperature, for 10-nm and 20-nm thickness of the receding Ti mask. (B) Variation of the ratio of lateral etch to etch depth with temperature.

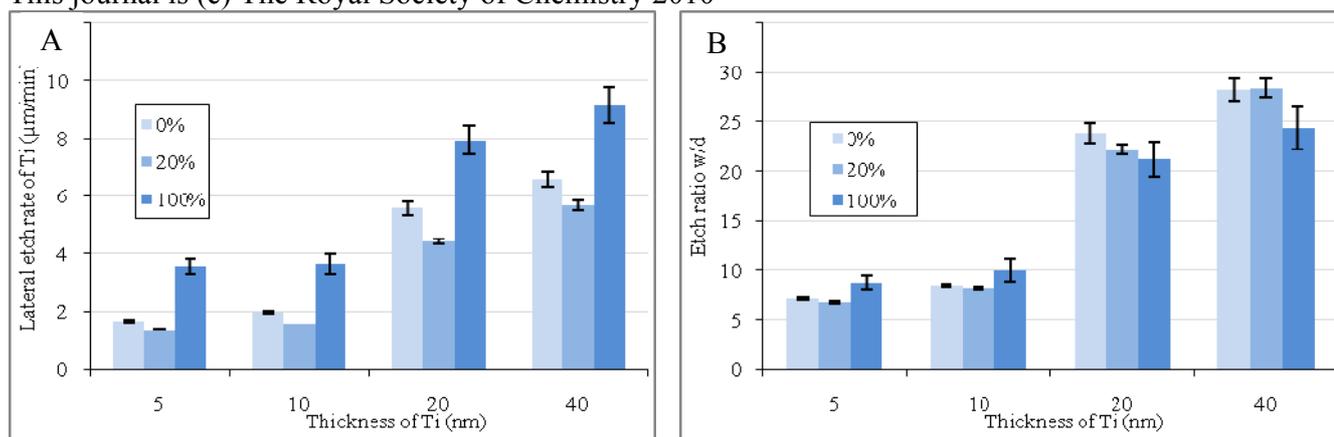


Fig. S3. Effect of ultrasound power setting on lateral and vertical etch kinetics with 24 minutes etch time at 35 ± 2 °C. (A) Lateral etch rate of the Ti film for four thicknesses of the titanium receding mask, each for three different ultrasound power settings. (B) Ratio of lateral to vertical etch depth for four thicknesses of the titanium receding mask, each for three different ultrasound power settings. Error bars in both plots represent two propagated standard deviations for ten data points collected across each die.

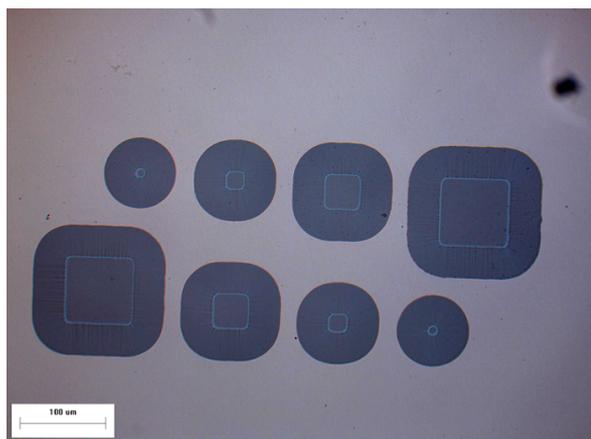


Fig. S4. Microphotograph of test features of various sizes etched with a 10-nm thick Ti layer for 24 minutes at 35 °C. While surface areas of the openings in the etch mask were different (100, 400, 1600, and 6400 μm^2), there was no measurable difference in lateral etch rates. The etch depth for all features determined by profilometry was also uniform at 4.6 μm .



Fig. S5. Microphotograph of a portion of an etched die with both biased (left side) and physically isolated (right side) mask features. The metal mask appears bright in this epi-illumination image. The die was etched with a -2.0 V potential applied to the metal mask. Features on the die that were electrically isolated by design show enhanced lateral etch and extended tapers, while the electrically connected, biased portion of the die exhibits steeper sidewalls.