

Supporting Information for “Vertical etching with isolated catalysts in metal-assisted chemical etching of silicon”

I. Etching in an electric field

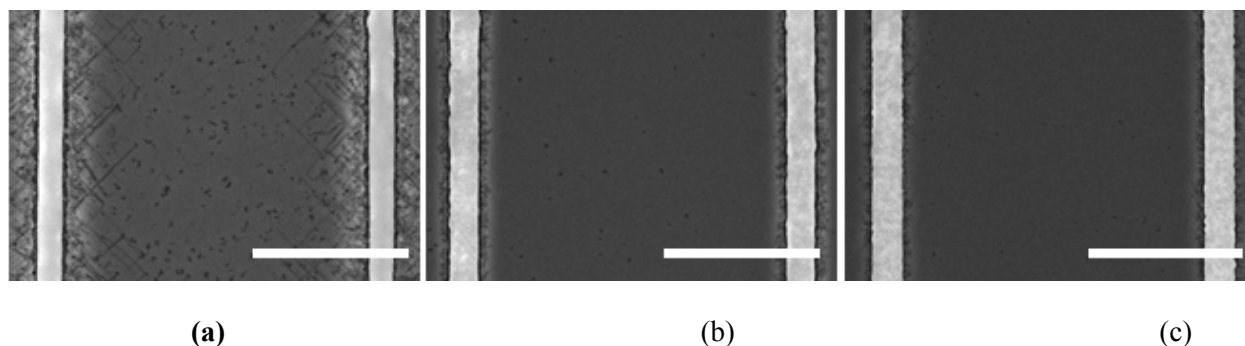


Fig. S1. (a–c) Top-view SEM images of samples with an Au strip spacing of 20 μm etched for 15 minutes in $[\text{HF}] = 1.73 \text{ M}$ and $[\text{H}_2\text{O}_2] = 0.46 \text{ M}$ with $U = 0, 10$, and 100 V , respectively. The scale bar for the SEM images is 10 μm . The etch rates were 0.062, 0.019, and 0.009 $\mu\text{m}/\text{min}$, respectively.

II. Determination of D value

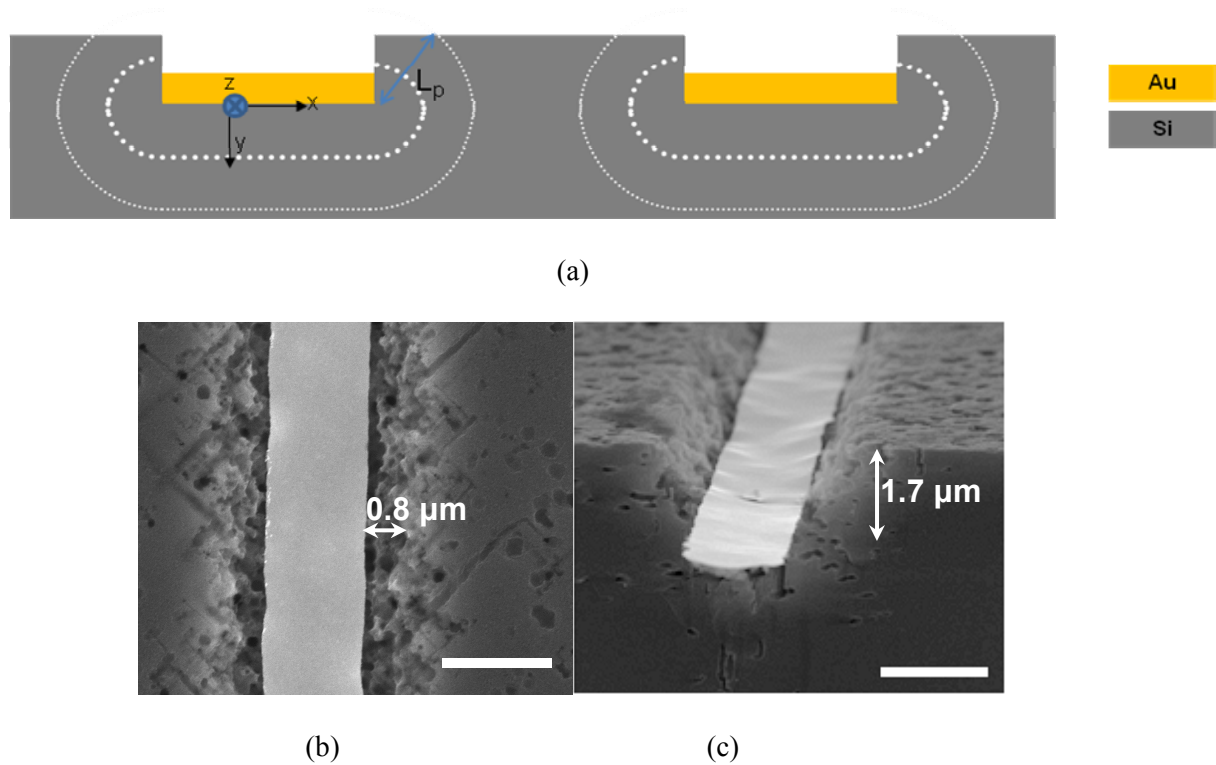


Fig. S2 (a) Schematic of 2-D isotropic hole diffusion inside Si during etching. (b–c) Top-view and cross-sectional SEM images of etched samples with strip spacing of 20 μm, etched with $[H_2O_2] = 1.21$ M. The $[HF]$ was fixed at 1.73 M and the etch duration was 20 minutes. The scale bar is 2 μm.

From Fig. S2b and c, the value of the hole diffusion distance can be estimated as

$$L_p = \sqrt{1.7^2 + 0.8^2} \times 10^{-6} m = 1.88 \times 10^{-6} m$$

So, the hole diffusivity can be obtained using

$$\sqrt{Dt} = L_p$$

to determine that $D = 2.94 \times 10^{-15} \text{ m}^2/\text{s}$.

III. Summary of SEM images used for construction of the etch stability diagram



Fig. S3. Cross-sectional SEM images of the etched samples used to construct the stability diagram in Fig. 11 in the main text. $[\text{HF}]$ was fixed at 1.73 M.