Supporting Information:

**Biodegradable porous silicon barcode nanowires with defined geometry**

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Supplementary Figure 1. Pore size and porosity increases as a function of H$_2$O$_2$.

N$_2$ absorption/desorption isotherms for <0.005 Ω-cm porous silicon nanowires synthesized in 0.1 M H$_2$O$_2$ (top) and 0.2 M H$_2$O$_2$ (bottom). Pore size as measured by BJH model increases from 6.1nm to 11.4nm, associated with an increase in BET measured porosity from 47% to 66%.
Supplementary Figure 2. SEM (Top panel) and Absorbance spectrum (Bottom panel) of <0.005 Ω·cm porous silicon nanobarcodes etched in 0.05 m H₂O₂, 2.9 m HF and 0.2 m H₂O₂, 2.9 m HF solution.
Supplementary Figure 3. Multicolor porous silicon nanopillars. Combining nanosphere lithography with variable porosification it is possible to obtain shape defined pillars with variable porosity along the major axis. (a) Scanning electron micrograph of a \(<0.005 \ \Omega\cdot\text{cm}\) multicolor nanopillar etched for 20 min in 0.05 M H₂O₂. (b) Magnification of the pillar in (A) showing the transition between low and high porosity chain link.
**Supplementary Figure 4.** Pore formation is orthogonal to the surface exposed to the electrolyte. (a) SEM micrograph of a fresh cleave through the diameter of a 5µm silicon pillar structure showing pores formed during metal assisted electroless etch. (b) Close-up view of the pillar showing pores radiating from the top edge due to the porosification occurring during the initial phase of the etch when the nanoparticle is still anchored to the original Si surface. Arrow indicates the transition point where the nanoparticle surpasses the porous structure. The 5µm pillar structure was obtained first depositing a 90nm layer of Si₃N₄ on the surface of a <0.005 Ω·cm p-type Si wafer, followed by photolithography and pattern transfer by CF₄ gas RIE to expose the underlying silicon field. Ag nanoparticles were selectively deposited on the Si from a solution of 2.9 M HF and 0.02 M AgNO₃ in the dark for 30 s. The porous pillars were formed by electroless metal etch in 0.1 M H₂O₂, 2.9 M HF for 15 minutes. The substrates were rinsed, cleaved and analyzed at the SEM.
**Supplementary Figure 5.** HRTEM imaging of porous nanowires indicates the absence of Ag nanoparticles within the porous structure. (a to d) Sequential zoom-in of the typical structure of a porous nanowire (0.01 Ω-cm silicon in 0.2 M H₂O₂ for 5 minutes). The porous nature of the wire is discernible and no Ag deposit is present.
Supplementary Figure 6. STEM/EDX analysis indicates the absence of Ag within porous nanowires. (a) HAADF STEM micrograph of a typical porous silicon nanowire (0.01 Ω-cm silicon in 0.2 M H₂O₂ for 5 minutes) suspended on a lacey carbon grid. Red box labeled 1 indicates the EDX analysis area (the area was divided into a 15x15 grid, 10s dwell time, 10° takeoff angle); (b) HAADF micrograph of with the 15x15 grid resolution. (c) Si k-line intensity map. (d) Ag k-line intensity map. (e) Ag l-line intensity map. (d-e) The intensity maps for Ag k-line, l-line and the position of the porous wire do not co-localize, indicating
that the observed signal is merely a fluctuation of the background intensity. (f) EDX spectrum in the spot of highest intensity for the Ag I-line (under the red arrow labeled 1). No distinguishable peak associated with Ag is present in this spectrum.
Supplementary Figure 7. Porosification is catalyzed by metal ions. Scanning electron micrographs of a fresh cleave of a <0.005 Ω-cm bare silicon substrate (a) following 30min immersion in 0.1 M H₂O₂, 2.9 M HF. (b) Following 10 min immersion in the 0.1 M H₂O₂, 2.9 M HF solution where a metal deposited <0.005 Ω-cm silicon substrate was etched immediately prior. (c) Following 10 min immersion in the 0.1 M H₂O₂, 2.9 M HF solution where a <0.005 Ω-cm metal deposited silicon substrate was being etched at the same time. Only samples in (b) and (c) show porosification, and no metal nanoparticles is present on the surface or within the porous structure.