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Wet Etching of Laser Ablated Si to Form Micro/Nano-Structured Porous Membranes SHANNON KNIGHT, KURT KOLASINSKI, Department of Chemistry, West Chester Univ — Nd:YAG laser irradiation (160 mJ at 532 nm in 6–7 ns pulses) transforms Si(100) by the production of conical pillars (tens of micrometer length, spacing several micrometer). Flowing Ar maintains a reducing atmosphere. We varied the pressure (1–300 mbar) to control redeposition and growth of material out of the laser plume onto the substrate. Laser ablated Si was anisotropically etched in 40 wt% KOH at 80 C. At short etch times defective material was removed to reveal the underlying crystal planes. Pillars, crystalline at their core, were sharpened to extremely high aspect ratios (as small at 10 nm tips on 50 m tall pillars). At longer etch times, etching along crystallographically defined directions lead to formation of oriented rectangular pores with side length ˜5 m. Stain etching of this structure in V_2O_5+HF(aq) lead to the formation of nanocrystalline, nanoporous Si walls that exhibit visible photoluminescence. Thus, we make hierarchical porous materials constructed of crystallographically ordered m pores, the walls of which we chose to be solid or porosified on the nanoscale. We are currently optimizing the process such that the macropores extend all the way through the substrate.

Kurt Kolasinski
West Chester Univ

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