**Use of Hydrogen Reactivity During Chemical Etching to Achieve Site-Specific Nano-Porosity**

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Nanoporous silicon surface has been studied extensively because of its well known photo-emission properties and related applications in optics. The high surface area in this material can be extremely useful for optochemical, gas, and biosensing applications. Formation of nanopores at desired sites and achieving some control over the number and average diameter of nanopores would open up completely new areas of application related to next-generation devices that can control the release of drugs, selected areas that can be used trap enzymes, and specific and well-defined sites that can be used carry out catalysis reactions.

In this study, we use microfabrication techniques combined with reactivity of hydrogen bubbles to produce nanopores at well-defined sites to create patterned nanoporous silicon surfaces. Hydrogen evolution through bubble formation from silicon surface during chemical etching is a known process. In an electrochemical etching reaction, etch-current density and etch-time can be useful variables that may allow tuning or adjustment of related etching properties. Because etch-current density and time are directly related to rate of hydrogen evolution and bubble residence time on silicon surface, low current densities can be used to enhance the residence times. We use arrays of microfabricated pits on n-doped silicon surface to localize hydrogen bubbles at lower current densities, ~5 $mA/cm^2$. The reactivity of hydrogen bubbles is then used to produce nanopores near pits. We are studying the effects of etch-time and current density on the nanostructure morphology with scanning electron and optical microscopy. Surface sensitive techniques such as luminescence, life-time and x-ray photoelectron spectroscopy are being used to establish a correlation between optical and surface properties.