

High Aspect Ratio Silicon Nanostructures Formed By Mace for Chemical and Biological Sensors

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Abstract

The use of high-aspect ratio silicon nanostructures as a sensor for detection of various analytes was investigated in the present study. Si nanostructure is a promising candidate due to ease of fabrication, large surface area, various accessible sizes and morphologies, controllable surface modification and its compatibility with conventional silicon processing technology. The optical or electrical properties of Si nanostructures are key sensing parameters that have been used in many chemical and biological sensing applications. Upgraded metallurgical grade wafers were used for the fabrication of nanostructures by metal assisted chemical etching (MACE). A detailed analysis of the optical properties is done by UV-Vis Diffused reflectance spectroscopy, Raman spectroscopy and photoluminance spectroscopy. Morphological properties, investigated by SEM, provides an insight into the physics of their formation. The adsorption of chemical or biological molecules into the pores modifies the electrical and optical properties, allowing convenient and sensitive measurement approach. The high aspect ratio of such nanoporous structures in chemical and bio sensing applications is addressed in the context of surface chemistry effects and nanostructures, measuring approaches and sensitivity and stability.

Keywords: Chemical sensors, Biosensors, Porous silicon, Optical, Electrical