3D Silicon Micro- and Nanostructures for Photonic Devices and Applications

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Two kinds of plasma etching-based techniques are introduced for fabricating 3D silicon micro- and nanostructures. The first technique is to combine anisotropic Bosch etch process with isotropic etch process, thus 3D periodic structures can be fabricated; the second technique is based on oblique-angled plasma etching, where the ion incoming angles are modulated, thus tilted or even wiggling structures can be realized. To demonstrate the applications of 3D silicon structures for nanophotonics, 3D photonic crystal membranes are fabricated, giving a complete photonic bandgap at near-infrared wavelength, planar cavities can also be included to enable applications like solvent sensors or optical bandpass filters. Another example shows the self-assembly behavior of 3D stacked silicon nanowires driven by electrostatic forces, the attached tips give a strong coupling of optical resonance from each nanowires.

Reference: