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Development of micro-/nano-architectures for intracellular sensing platform

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ABSTRACT

Currently available nanotechnologies are capable of creating various nanostructures in controlled dimensions such as particles (0D), wires (1D), membranes (2D), and cubes (3D) by exploiting “top-down” or “bottom-up” methods. However, there exist limitations to systematically construct hierarchical nanostructures with geometric complexities. This study is focused on developing a novel nanofabrication strategy that can rationally produce a set of hierarchical nanostructures configured with precisely engineered facets, tip shapes, and tectonic motifs. We aim to identify a collection of optimal materials, array layouts, basic components, and nanofabrication techniques for the production of hierarchical nanostructures by exploiting device-grade semiconducting silicon materials. To accomplish this, device-grade silicon was processed by traditional photolithographic methods to create precisely engineered three-dimensional shapes. The three-dimensional structures were then layered with random patterns by exploiting metal-assisted chemical etching, leading to significantly increased surface areas with arbitrary morphological complexity.

KEYWORDS

Nanostructures, intracellular sensing, photolithography