

## Intracellular Electrical Stimulation on PC-12 Cells through Vertical Nanowire Electrode

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Nanotechnology, especially vertically grown silicon nanowires, has gotten great attentions in biology due to characteristics of one dimensional nanostructure; controllable synthetic structure such as lengths, diameters, densities. Silicon nanowires are promising materials as nanoelectrodes due to their highly complementary metal-oxide-semiconductor (CMOS) - and bio-compatibility. Silicon nanowires are so intoxicated that are effective for bio molecular delivery and electrical stimulation. Vertical nanowires with integrated Au tips were fabricated for electrical intracellular interfacing with PC-12 cells. We have made synthesized two types of nanowire devices; one is multi-nanowires electrode for bio molecular sensing and electrical stimulation, and the other is single-nanowires electrode respectively. Here, we demonstrate that differentiation of Nerve Growth Factor (NGF) treated PC-12 cells can be promoted depending on different magnitudes of electrical stimulation and density of Si NWs. It was fabricated by both bottom-up and top-down approaches using low pressure chemical vapor deposition (LPCVD) with high vacuuming environment to electrically stimulate PC-12 cells. The effects of electrical stimulation with NGF on the morphological differentiation are observed by Scanning Electron Microscopy (SEM), and it induces neural outgrowth. Moreover, the cell cytosol can be dyed selectively depending on the degree of differentiation along with fluorescence microscopy measurement. Vertically grown silicon nanowires have further expected advantages in case of single nanowire fabrication, and will be able to expand its characteristics to diverse applications.

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