Supplementary information

Electrolyte-free Amperometric Immunosensor using a Dendritic Nanotip

Jong-Hoon Kim, Morgan Hiraiwa, Hyun-Boo Lee, Kyong-Hoon Lee, Gerard A. Cangelosi and Jae-Hyun Chung*

Department of Mechanical Engineering, University of Washington, Box 352600, Seattle, WA, 98195
NanoFacture, Inc., P.O. Box 52651, Bellevue, WA 98015
Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA, 98195
*Corresponding Author
Jae-Hyun Chung: Tel/ Fax 1-206-543-4355/ 1-206-685-8047, E-mail: jae71@uw.edu

Simulation results: current density comparison with various numbers of nanowires on nanotip

![Dendritic nanotip](image)

(a) Fig. S1 (a) Electric field distribution of the dendritic nanotips having 2, 4, and 6 nanowires (b) Current densities of the dendritic nanotips having 2, 4, and 6 nanowires

To compare the current density with a different number of nanowires, we conducted the simulation using finite element method software (COMSOL Multiphysics®, COMSOL, Inc., Palo Alto, CA.). On a nanotip, the number of nanowires was changed to 2, 4, and 6 as shown in Fig. S1. The model consisted
of a coil (outside diameter: 2.1 mm and inside diameter: 1.9 mm), a spherical droplet (diameter: 2.0 mm) and a nanotip (the terminal end diameter: 1 μm and length: 250 μm). The nanotip was connected to a microwire (diameter: 50 μm and length: 350 μm). For the dendritic structures of nanotip, nanowires were added on the single nanotip. The distance between the nanowires is 10 μm in the model. The number of nanowires varied from 2 to 6 in the simulation. The ground condition (V=0V) and the electric potential (V0=1V) were applied to the coil and the microwire, respectively. Electric insulation condition (-n·J=0, J is current density) was given at the surface of the droplet. As shown in Fig. S1(b), the difference of the current density on the nanotip surface increases with increase of the number of nanowires. The simulation results predict that a higher packing density of nanowires and a larger number of nanowires should increase the sensitivity of a nanotip sensor due to the enlarged current density.