Electronic Supplementary Material (ESI) for RSC Advances

Supplementary information

Electrolyte-free Amperometric Immunosensor using a Dendritic Nanotip

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

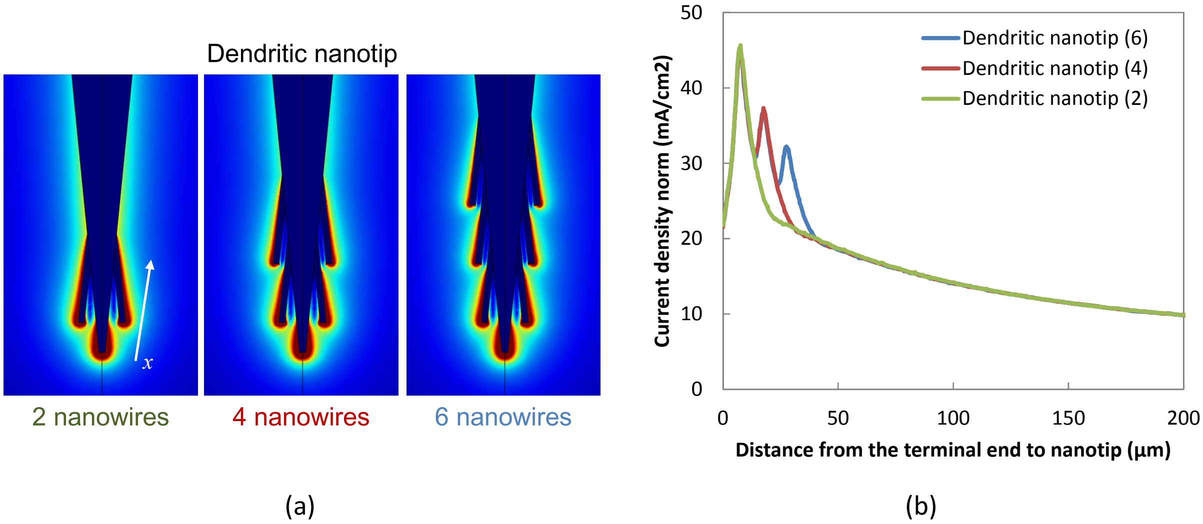

Fig. S1 (a) Electric field distribution of the dendritic nanotips having 2, 4, and 6 nanowires (b) Current densities of the dendritic nanotips having 2, 4, and 6 nanowires

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 ($-n \cdot J=0$, 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.