

Controllable growth of palladium nanowire for highly sensitive hydrogen sensor

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With the increasing interest in nanoscale science and technology, nanowires have been the subject of a great deal of research in the past decade. The most common techniques for fabricating such nanowires are the bottom-up fabrication paradigms with the major drawback that the nanowires need to be located in a predetermined position for the integration of nanowire-based sensors. In order to address these problems, we report for a novel method of fabricating a single Pd nanowire based on a two step growth process, which is composed of electrochemical deposition and the dielectrophoresis (DEP) process. The first step is Pd grain growth by electrochemical deposition on electrodes. Then, a single Pd nanowire is generated by the conventional DEP process between the Pd grains near the two electrodes. Furthermore, we investigated the role of process conditions such as synthetic chemistry, electric field, geometry of the prepatterned electrodes to control the size and width of palladium nanowire. Finally, hydrogen sensing using a single Pd nanowire sensor is demonstrated.