Short Communication

Characterization of the Electrical Properties of Silicon Nanowire using the Dielectrophoretic Assembling Platform

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In this study, the electrical properties of silicon nanowire were measured with a dielectrophoresis alignment platform. A pair of nickel electrodes spaced 10 μm apart was fabricated on a quartz substrate using a lithography process. Then, silicon (Si) nanowires in the solution were attracted to the electrodes near them with an aid of dielectrophoretic force. As a result, Si nanowires that were longer than 10 μm in length bridged the gap between the electrodes, forming a pair of Si nanowire sensors. Under an AC voltage with an amplitude of 10 Vpp and a frequency of 100 kHz, approximately 20 Si nanowires can bridge the gap between the electrodes within approximately 10 s. After the solution evaporated, the Si nanowires were fixed by clamping them onto the upper and lower nickel electrodes using a second lithography process and a metal deposition process. Characterizations based on the current–voltage curve showed that this fixing process can reduce the contact resistance between the nickel and Si nanowires and allow an ohmic contact to form between them. Consequently, the properties of the devices became more stable, which verified the possibility of using the assembled Si nanowire sensors as biosensors.

Keywords: silicon nanowire, nanowire sensor, dielectrophoresis, microfabrication

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