

On demand nanowire device decalomania

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An increasing number of technologies offering a chance of industrialization to the concept of recent advanced electronic nano-buildings require large-scale integration of disparate types of separately fabricated devices into intentionally organized systems. For example, with building blocks having the quantum confinement effect, ultrahigh sensitive surface, and nano flexoelectricity, nanowire logic gate, nanowire bio sensor, and nano power generator have been received attractive attention. In this paper, we suggest a special nanowire decalomania to fabricate various functional nano buildings with any nano building block at any position on any substrate through the large area. The bottom up nano-bridge is constructed by dielectrophoresis before they are litho freely integrated on demanded substrate with a perfect positioning freedom. The interfacial property of bad adhesion between fully cross linked Polydimethylsiloxane (PDMS) and gold thin film is the key of our decalomania. The array of Si nanowire (NW) transistors here shows the potential of device integration programming keeping up pace with progress of bus line printing such as ink jet printing, microcontact printing. Consequently, our decalomania can be a new way to fabricate all kinds functional NW device on a chip.

Keywords: Nanowire device, Contact printing, Dielectrophoresis, Transistor

Press induced enhancement of contact resistance in nanocomposite FET based on ZnO nanowire/polymer

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A simple route of external mechanical force is presented for enhancing the electrical properties of polymer nanocomposite consisted of nanowires. By dispersing ZnO nanowires in polymer solution and drop casting on substrates, nanocomposite transistors containing ZnO nanowires are successfully fabricated. Even though the ZnO nanowires density is properly controlled for device fabrication, as-cast device doesn't show any detectable currents, because nanowires are separated far from each other with the insulating polymer matrix intervening between them. Compared to the device pressed at 300 kPa, the device pressed at 600 kPa currents increased by 50 times showing the linear behavior against drain voltage and exhibits promising electrical properties, which operates in the depletion mode with higher mobility and on-current. Such an improved device performance would be realized by the contacts improvement and the increase of the number of electrical paths induced by external force. This approach provides a viable solution for serious contact resistance problem of nanocomposite materials and promises for future manufacturing of high-performance devices.

Keywords: ZnO nanowire, Polymer composite, Transistor