B-3

On demand nanowire device decalcomania

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An increasing number oftechnologies offering a chance of industrialization to the concept of recentadvanced electronic nano-buildings require large-scale integration of disparatetypes 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 attractiveattention. In this paper, we suggest a special nanowire decalcomania tofabricate various functional nano buildings with any nano building block at anyposition on any substrate through the large area. The bottom up nano-bridge isconstructed by dielectrophoresis before they are litho freely integrated ondemanded substrate with a perfect positioning freedom. The interfacial propertyof bad adhesion between fully cross linked Polydimethylsiloxane (PDMS) and goldthin film is the key of our decalcomania. The array of Si nanowire (NW)transistors here shows the potential of device integration programming keepingup pace with progress of bus line printing such as ink jet printing, microcontact printing. Consequently, our decalcomania can be a new way to fabricateall kinds functional NW device on a chip.

Keywords: Nanowire device, Contactprinting, Dielectrophoresis, Transistor

B-4

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

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A simple route of externalmechanical force is presented for enhancing the electrical properties ofpolymer nanocomposite consisted of nanowires. By dispersing ZnO nanowires inpolymer solution and drop casting on substrates, nanocomposite transistorscontaining ZnO nanowires are successfully fabricated. Even though the ZnOnanowires density is properly controlled for device fabrication, as-cast devicedoesn't show any detectablecurrents, because nanowires are separated far from each other with theinsulating polymer matrix intervening between them. Compared to the devicepressed at 300 kPa, the device pressed at 600 kPa currents increased by 50times showing the linear behavior against drain voltage and exhibits promisingelectrical properties, which operates in the depletion mode with highermobility and on-current. Such an improved device performance would be realizedby the contacts improvement and the increase of the number of electrical pathinduced by external force. This approach provides a viable solution for seriouscontact resistance problem of nanocomposite materials and promises for futuremanufacturing of high-performance devices.

Keywords: ZnO nanowire, Polymercomposite, Transistor