Directed Wiring of Zinc Oxide Nanowires

J.B.K. Law[1], K.S. Yeong[1], C.B. Boothroyd[2], J.T.L. Thong[1]

[1]Department of Electrical and Computer Engineering, National University of Singapore, 4 Engineering Drive 3, 117576, Singapore.

[2]Institute of Materials Research and Engineering, 3 Research Link, 117602, Singapore.
Email : g0404225@nus.edu.sg

In this work, we report a novel method of connecting a one-dimensional nanostructure to an electrode by directed growth of a nanowire from a nanostructure through the technique of field emission induced growth with an organo-metallic precursor gas[1,2], to form a nanowired metal-semiconductor junction with rectifying behavior. The nanostructure consists of single-crystal ZnO nanowires which were grown pointing laterally out from a patterned electrode on a SiO_2 coated Si substrate (Figure 1a). These ZnO nanowires have diameters ranging from 20nm~40nm and form reasonable lateral field emitters. An adjacent electrode is positioned with a gap spacing of between 2-5 μm. By biasing the opposing electrode, a ZnO nanowire at one end of the electrode is made to field emit, and in the presence of tungsten carbonyl vapour as the precursor, a tungsten nanowire is grown from the ZnO nanowire tip and directed towards the biased electrode to form a nanowired connection (Figure 1b). I-V measurement of the metal (W nanowire) to semiconductor (ZnO nanowire) junction shows rectifying behaviour. This work paves the way for future possibilities of directed nanowiring by external biasing to interconnect nanostructures.

REFERENCES :

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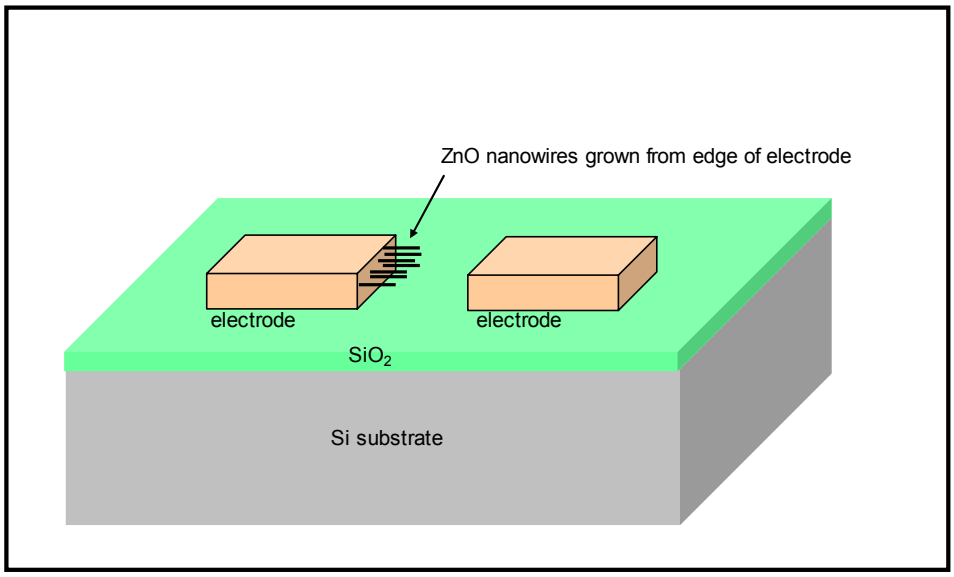

Figure 1a : ZnO nanowires grown laterally on patterned electrodes

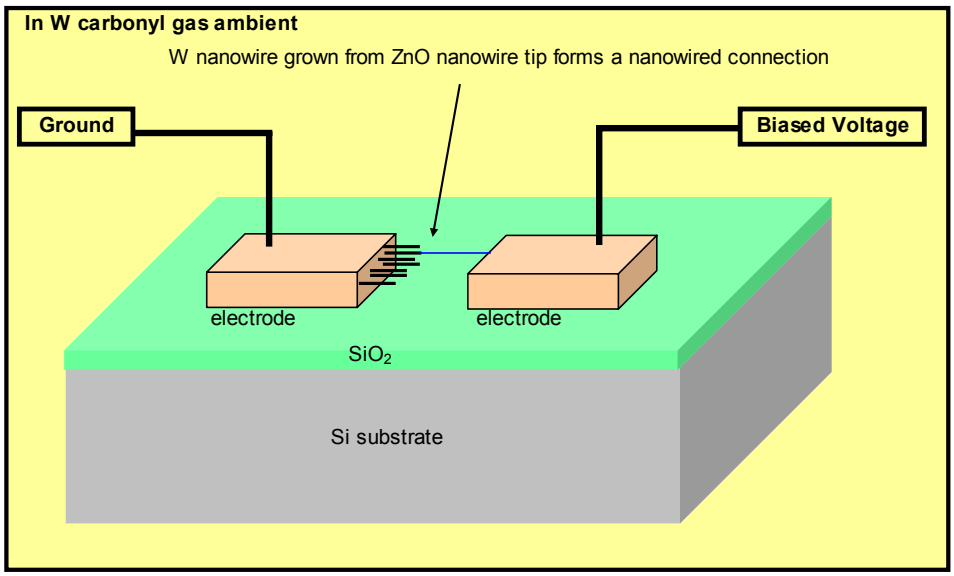

Figure 1b: By applying a bias to one electrode, a ZnO nanowire at the opposing end is made to field emit, and in the presence of W carbonyl as precursor gas, a W nanowire is grown from the ZnO nanowire tip and directed towards the biased electrode to form a nanowired connection