Gas sensors using oxide nanowire networks

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Single crystalline oxide semiconductor nanowires (NWs) with high surface area, good crystallinity, and excellent thermal stability are very promising to achieve high gas response, rapid responding/recovery speed, and good sensor stability. The gas sensors using oxide NWs can be divided into single NW sensors and NW network sensors according to the configuration of NWs. Although, the single NW sensor provides valuable information on the gas sensing mechanism of oxide NWs, the well-defined patterning of electrodes precisely onto a single oxide NW requires a sophisticated process such as e-beam lithography. Thus the more realistic, reproducible, and cost-effective sensor fabrication is essential for the real applications using oxide NWs. The additional benefits of NW networks as the gas sensing materials are (i) the rapid and effective diffusion of analyte gases through less agglomerated configuration of NW networks, (ii) the enhancement of gas response at the resistive contacts between NWs, and (iii) the uniform loading of catalysts (or additives) onto the entire sensing materials, all of which are essential aspects in the design of high performance gas sensors. This talk will cover (i) the gas sensors using oxide NW networks, (ii) various physic-chemical routes to fabricate NW network sensors, (iii) gas sensing mechanism of oxide NW network gas sensors, (iv) the effect of NW-NW contact on the gas sensitivity, (v) the enhancement of gas sensing characteristics by the functionalization of NW surface, and (vi) other advantages of NW network gas sensors.