ZnO Nanorods on the 128LN Substrate for Surface Acoustic Wave Sensors

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Development of high performance passive wireless sensors for environmental monitoring, clinical diagnostics, food and process control is of great interest for scientific and research community. The passive wireless surface acoustic wave (SAW) sensor for gas and humidity detection which consists of two ohmically connected separated elements: SAW tag and resistive hydrogen sensor utilizing *Pt*-coated *ZnO* nanorods has been recently described[1].

In this work the technology of *ZnO* nanorods growing is presented, which can be applied in 2-port SAW sensor (Fig.1). The sensor consists of two interdigital transducers (IDT), sensing element formed between IDTs and two reflecting arrays (RA) on 128°YX-$LiNbO_3$ substrate. Alternatively, two facing each other SPUDTs can be used.

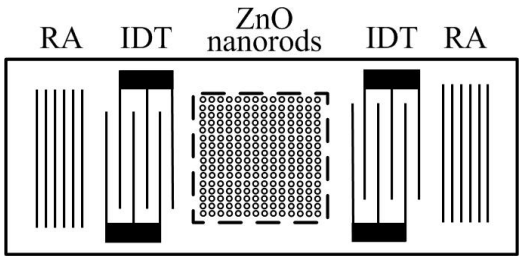

Fig. 1: The structure of the SAW sensor.

The *ZnO* nanorods (Fig. 2) as sensing element are synthesized between IDTs on the piezoelectric substrate in zinc nitrate based solution by nanotechnological approach "bottom-up" which provides the nanostructures formation by self-organization at the low-temperature chemical processes without expensive vacuum and other microelectronic technologies. The diameter of each rod was 30-60 nm and the length of about 0.6 μm.

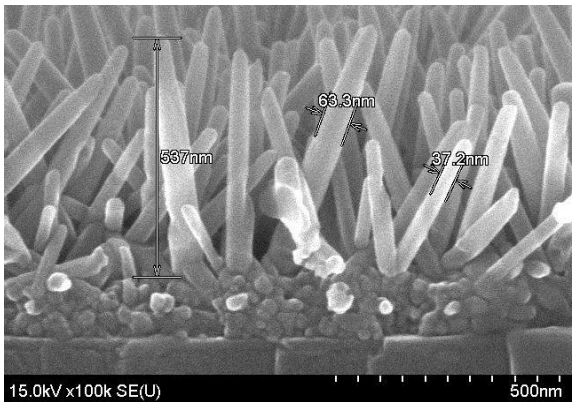

Fig. 2: SEM images of the ZnO nanorods grown on 128°YX-$LiNbO_3$ substrate.

Developed SAW sensor provides sensitivity enhancement of the sensor system due to utilizing of proposed resonator design and nanostructured sensing layer. Nanorods could be additionally coated by the active layer for selectivity improvement, e.g. deposition of the *Pd* layer provides selective detection of hydrogen. Greatly increased surface area of active layer not only improves sensitivity but also decrease the response time, that allows the application of such configuration in smart integrated sensor systems.

[1] Ya-Shan Huang, Yung-Yu Chen and Tsung-Tsong Wu, "A passive wireless hydrogen surface acoustic wave sensor based on Pt-coated ZnO nanorods", Nanotechnology, 21, 095503, 6 pp., 2010