PVSSD 3P INDIUM-TIN-OXIDE THIN FILM STRAIN-SENSOR BEHAVIORS STUDY USING CYCLIC INDENTATION

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ITO films based sensors are largely studied last two decades. Piezoelectric properties were investigated depending on parameters and suitable manufacturing methods, ITO film thickness, thermal treatment etc. They belong to the class of ceramic sensors with outstanding physical properties, such as: thermal, electrical and chemical stability, adhesion [1], transparency, thermo-electricity, conductivity, piezoresistivity. Possibility of obtaining of ITO films on a wide range of substrates of different chemical origin opens the way for the devices manufacturing of complex use. For example, the use of ITO films as transparent contacts for solar cells can serve simultaneously to measure their temperature, or linear dimensional variation under thermal or mechanical deformation [2].

Sensitivity of strain sensors are determined by the gouge factor G, ec. (1):
$G= \Delta R/(R*\varepsilon)$ ec. (1),
where R is the initial resistance of the gauge system and ΔR is the variation of resistance introduced by the ε strain. Various load-bending tests were used for ITO strain sensors investigation and gouge factor ranged between -2 and -70 [3]. Nanoindentation tester was used for apply the strain on our samples. Similar idea was used for measure film elastic modulus in [4]. Cyclic nanoindentation method allows us to bend ITO/glass strips with constant rate and analyze sensitivity and electrical response of studied sensors.

The piezoresistive effect in thin indium-tin-oxide (ITO) films on glass substrate has been investigated using cyclic nanoindentation method. Samples were made of 500 nm thick ITO film deposited by magnetron sputtering on the glass.

The resistance variation of ITO/glass based sensors during cyclic sample bending show a good sensitivity and fast response to mechanical strain. Gage factor ranging from 24 to 30.

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