

CONTEMPORARY METALLIC MATERIALS

Md Abdul Maleque
Iskandar Idris Yaacob
Zahurin Halim



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Edited by:

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Piezoelectric Effect of Zinc Oxide Thin film as Source of Energy for Sensor Applications

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Keywords: Piezoelectric, ZnO, Sensor

Abstract: A thin film of Aluminum doped ZnO (AZO) was observed to have a great potential in producing piezoelectric effect. At 200°C of sputtering temperature, with a composition of 5.47%Zn, 45.83%Al and 48.70%O, the AZO thin film was able to produce 1,640mV when 30 kHz of vibration applied on it. This was proven by XRD, that AZO exhibit wurtzite structure at (002) plane with 34.04° angle orientation of 2 θ .

Introduction

Piezo or piezin is a Greek word means to squeeze or press. The piezoelectricity is derived from the word which indicates the ability of some materials to produce an electric field or electric potential (voltage) in reaction to applied stress. When mechanical stress is applied into the material, the material's volume and its polarization density will change accordingly and create the effect of piezoelectricity. Since piezoelectricity is another way to produce clean energy besides solar, wind power and hydro, it is worthy to grasp this potential and use it in wider applications. With a great capability of piezoelectricity, industrial sectors have adopted this concept and it has been manipulated to develop new technology and products. One of the areas is in sensing technology where sensor application becomes wider and demanding. There are many potential materials that show this affects for example quartz, various titanates (e.g. Lead zirconate titanate; PZT), lead zirconate, cadmium sulphide and zinc oxide. But, with a great reduction of part thickness and sizes nowadays, ZnO (Zinc Oxide) thin film was chosen as one of an electric source provider for sensor.

Experimental

Materials

Aluminum doped Zinc Oxide (AZO) thin film was used as a target which Aluminum was substrate from Aluminum foil and small portion of sample was coated with gold.

Equipments

RF magnetron sputtering machine (ULVAC), X-Ray diffraction machine (XRD-6000, Shimadzu), Energy dispersive Spectroscopy (JEOL), Atomic force microscope (JEOL), Resistivity meter (MCP-T610, Loresta GP), Digital storage oscilloscope (GW-Instek GDS 810s) and ultrasonic cleaner (Chrom Tech) were used during experiment.