Project Leader: Dr. Suriati Paiman
Growth of zinc oxide nanowires on RF-sputered zinc oxide thin films for nanogenerators using microwave-assisted chemical bath deposition.

Executive Summary
Power consumption has become a major issue in nanodevices due to the miniaturization of portable devices. This problem includes limitation in the battery size and recharging process. There are demands for self-generated power, which can harvest energy from mechanical energy into electricity by using piezoelectric one-dimensional nanomaterials. ZnO nanowire arrays seem to be the most promising energy technologies that could self-powering nanodevices (nanogenerator). The aforementioned device demands nanowires with good morphology, high-quality crystal structure and controllable electrical properties. This can be realised by tailoring the growth parameters to achieve structurally controlled nanowires. A possible approach to obtain desired ZnO nanowires is to control the ZnO thin films that act as a seed layer for nanowire growth. Various strategies adopted to produce ZnO nanowires with optimum properties using solution growth technique. However, the seed layer condition and its chemical reaction during growth are still not completely understood. This project deals with the growth of ZnO nanowires via chemical bath deposition (CBD) mechanism using microwave-assisted technique. Initially, ZnO thin films will be deposited on the glass substrate by radio frequency (RF) magnetron sputtering technique using various deposition parameters (RF power, pressure, oxygen ratio) to achieve the optimum seed layer quality (thickness, surface roughness and crystallinity). The optimised ZnO seed layer will then be used in CBD to facilitate the growth of ZnO nanowire arrays by varying the temperature, time, pH, chemical precursors and solution concentration. A successful investigation of the project will lead to novel ZnO nanowire arrays that are suitable for piezoelectric nanogenerators.

Project Leader: Dr. Suriati Paiman
Deposition and Characterization of Zinc Oxide thin films by RF Magnetron Sputtering For Optical Sensing Applications.

Executive Summary
The project aims to develop a project in the area of the optical sensors, with the main objective of studying good quality zinc-oxide (ZnO) thin films for photonics applications. In this research work, we focus mainly on the study of ZnO thin films and its fabrication via radio frequency (RF) magnetron sputtering technique with the objective to focus on understanding the effect of deposition parameters (working pressure, RF power, temperature and deposition time). ZnO thin films will be deposited on silica glass substrate at room temperature. Effect of post annealing will be studied to observe the improvement in crystal growth. Due to sensing mechanism, the interaction between ZnO thin film and tested gas will be investigated. The films will be characterized using profilometer, x-ray diffraction (XRD), fourier transform infrared (FTIR), atomic force microscopy (AFM), and ultra violet and visible light spectroscopy (UV-VIS) and raman spectroscopy. The success of this research work thus provides the basis understanding about sensing mechanism of ZnO thin films for optical sensors applications produced by RF magnetron sputtering.