

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
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& design  
exposition 2014

INNOVATEUR  
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2014

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UNIVERSITI TEKNOLOGI MARA  
MALAYSIA

*Bridging  
the valley of death :  
advancing the  
commercialisation  
of research*

RESEARCH BOOK

# iiindex2014

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innovation  
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## FOREWORD

The Honourable Minister of Science, Technology and Innovation (MOSTI) has launched 2014 as Malaysia Commercialisation Year 2014 (MCY2014) with the theme Science Technology and Innovation (STI) for Wealth Creation. In line with this theme, Invention, Innovation, Design & Exposition 2014 (iidex2014) is an annual exposition organized by UiTM and is the ultimate platform to highlight and commercialise new inventions and innovations. Researchers and inventors will exhibit their products which cater to the needs and wants of the community and the country.

The iidex2014 creates a new dimension by fusing two competitive concepts, a competition among innovative products and a competition to invite Innovateur Wannabes to perform live pitching of their products to the audience. The iidex2014 focuses on comprehensive commercialization and creating opportunities for entrepreneurs to carry out R&D as well as to provide avenue to commercialise their products. Through expositions such as iidex2014, MOSTI hopes to inculcate the culture of commercialisation of new technology designed and created by Malaysians.

I wish to congratulate all the participants of the iidex2014 and this is the opportunity for all researchers to show their ideas and exhibits their products and creativity. Apart from showcasing their products, innovators will have the opportunity to provide a window to the industry for business matching during the exposition.

Tan Sri Dato' Sri Sallehuddin Mohamed  
Pro-Chancellor, Universiti Teknologi MARA

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## THE EFFECT OF AU-SEEDED THICKNESS TO THE GAS SENSING PROPERTIES OF ZNO NANOSTRUCTURES OBTAINED BY MIST-ATOMIZATION ON HEATED SUBSTRATES

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Zinc oxide (ZnO) is an n-type semiconductor with a wide direct band-gap of 3.37 eV at room temperature. ZnO exhibit high-transparency in the visible region, near-UV emission, magnetic, piezo-electric, high-conductivity [1] and piezoelectric dual properties [2]. Its properties can be adjusted by controlling size and morphology [3]. Wide application of ZnO has been found such as varistor, gas sensor [4], UV photoconductive sensor [5], high-efficient green phosphor, field emission displays and solar cell [3]. ZnO also display a strong bonding energy of 60 meV, much larger than gallium nitride (GaN, 25 meV). Zinc oxide (ZnO) nanostructure is very responsive and sensitive towards the synthesis methods. Low-dimensional ZnO nanostructures like nanowires, nanorods, and nanotubes may be selectively formed to be considered for usage in new application areas and developing existing applications in nanoelectronics and nanophotonics due to their efficient transport of electrons and excitons [6], large surface-to-volume ratio and quantum confinement effects [7]. The synthesis methods often face limitations in terms of sample uniformity, substrate selection, and low product yield. On the contrary, approaches using solution-based are attractive because of the low temperature growth, potential for scaling up and much easier operation in fabricating high-density ZnO arrays [8], however vapor method give better results in synthesizing ZnO nanostructures in room temperature (RT). In this paper, we focus on the synthesis of ZnO nanostructures were obtained by a simple and low-cost synthesis method; mist-atomization. The starting materials for this synthesizing method are zinc nitrate hexahydrate as precursor solution and hexamethylenetetramine (HMTA) as the stabiliser. ZnO nanostructures were deposited by mist-atomization with applied heat from substrates' downside. The glass substrates first seeded with gold (Au) with 0, 6 and 12 nm thickness. The gas sensing properties of the samples were examined by UV-Vis (UV-Visible) spectroscopy, Field Emission Scanning Electron Microscope (FESEM) micrograph and I-V (Current-Voltage) measurement. FESEM micrographs show the different morphology of ZnO nanostructures obtained on different Au-seeded thickness glass substrate. There is improvement in UV region analysed from ZnO nanostructure growth on 6 nm Au-seeded glasses. I-V measurements also show some improvement in gas sensing properties of ZnO on different Au-seeded glass substrate. The optical, morphological properties and I-V (IV) measurement of sprayed ZnO nanostructures growth on different Au-seeded glass substrate largely depend on the substrates temperature during spraying the zinc acetate solution and on the Au-seeded glass substrates.