

CELEBRATING
COMMERCIALISATION
YEAR 2014

iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention
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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

AN INTERNATIONAL EXPOSITION ON RESEARCH AND 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
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AIR-TIGHT RADON CHAMBER FOR DETERMINATION OF SUPPORTED RADON CONCENTRATION IN WATER

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Humans are exposed to radiation from natural radionuclides of uranium, thorium and Potassium-40. Isotopes of uranium and thorium decay in chains form through various daughter radionuclides before reaching stability. Radon is a radioactive gas produced in the decay chains, an offshoot of soluble radionuclide, radium. There are three main isotopes of radon, Radon-222, Radon-220 and Radon-219. Of the three isotopes, Radon-222 is more radiological importance. When present in water radon would gain entry into our body through ingestion. Being a relatively high energy alpha particle emitter together with its progenies, they could initiate radiological risk to our body, especially when ingested at high concentration. The common method of determining radon concentration in water is by measuring the gamma-rays emitted by the progenies of radon. In the present study an air-tight chamber was developed using discarded metal container and coupled to a continuous air radon monitor and solid state nuclear track detector for determination of supported radon concentration in water samples. Metal container was preferred against plastic or polyvinyl chloride (PVC) container to avoid static electricity attraction of the emitted alpha particles on to the container's wall. This might render underestimation of results. Prior to measurement the chamber was optimized for sample temperature, chamber gas content, measurement period and pumping rate. The solid state track detector was calibrated against the continuous air radon monitor and tested. The optimized conditions were room temperature, purged using nitrogen gas for about five minutes, measurement period of twenty four hours, and pumping rate of 1.2 litres per minute. Results were verified using gamma-ray spectrometry. Repeatability, accuracy and precision study was also carried out. The continuous air radon monitor gives hourly diurnal radon concentration in the chamber. A plot and mathematical fittings of the hourly concentration would give the supported radon concentration in water samples. The exposed solid state nuclear track detector was etched using 6N sodium hydroxide solution at seventy degree Celsius for six hours, and cleaned using running water for one hour and left to dry. The etched tracks were observed and counted under four hundred times magnification digital optical microscope. Using calibration factor the radon concentration in the water samples can be calculated. The verification using gamma-ray spectrometry was carried out by the determination of gamma-rays emitted by daughters of radon, assuming they are in secular equilibrium condition. Very good agreement of results with standard gamma-ray spectrometry method was obtained. For precision, accuracy and repeatability studies, standard liquid sample of known radium concentration were prepared and measured using the developed chamber method. Precision, accuracy and repeatability of within less than ten percent variation were obtained. The developed method was able to determine radon concentration in water with good accuracy, relatively fast and cheap. The chamber developed was then applied to water samples collected from the water supply chains in Cameron Highlands, Pahang area. Samples were collected at water sources (rivers and dams), various parts of treatment plants and homes for drinking and other domestic usage. Results indicated that supported radon concentration in the water samples were all below the permissible limit, while the ingestion dosages implicated minimum radiological risks to consumers.