

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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ELECTROSPRAY DRYING FOR PRODUCING ACTIVE PHARMACEUTICAL INGREDIENTS (API) NANOPARTICLES

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Nanoparticles preparation of Mefenamic acid (MA) form I by using an electrospray drying method was conducted in this study. Mefenamic Acid (MA) is an anthranilic acid derivative and a non-steroidal anti-inflammatory drug. It is widely used in minor to moderate pain including headache, dental pain, postoperative and postpartum pain, dysmenorrhea, osteoarthritis. MA has two polymorphs, which is form I and II, and they also show different solubility and stability. To reduce size of MA, electrospray drying was used in this study. Electrospray drying is a process that uses electrostatic force to disperse a conductive liquid jet into fine charged droplets through the solvent evaporation and coulomb fission. When the solvent evaporation occurs, the mass of droplet will reduce and due to this condition the droplets becomes highly charged and is unstable. The instability of droplet forces it to disperse into small droplet and finally dry into fine particles and is deposited to the substrate. Depending on the strength of the electric stresses in the liquid, different spraying modes will be obtained which is dripping, pulsing, cone jet and multi jet and electrospray drying modes operation usually in cone jet mode. The prepared MA solutions with conductivity $2.77 \mu\text{Scm}^{-1}$ and $8.55 \mu\text{Scm}^{-1}$ for concentration 0.055 and 0.041 M respectively were placed inside 20 ml plastic syringe connected with stainless steel needle as a nozzle. Applicable solution conductivity for electrospray drying should be in the range of $1 \mu\text{Scm}^{-1}$ to 10mScm^{-1} during the formation of stable cone jet mode. The solution was pumped at flow rate 3-6 ml h⁻¹ through a 0.15 mm inside diameter needle by using a syringe pump. By applying the applied voltage at 1.3-1.5 kV with positive polarity and counter electrode with 7 mm diameter circular opening in the centre was positioned in perpendicular to the needle, cone jet mode was formed at the tip of needle prior to the electrospray drying. During electrospray drying process, solvent evaporation from the droplet was occurring that leads to coulomb disruption and may generate to nanoparticles. The dried nanoparticles were collected on a grounded substrate that was placed at varying distance which is 12 to 15 cm from the tip of needle. Electrospray drying under cone-jet mode can be used to produce nanosized particles in the range 100-400 nm. The electrospray process with cone jet mode was able to produce nanosized and monodisperse particle. The particle size was determined by the distance from tip to needle, at far distance, it was able to produce smaller particle than the particle at short distance due to repeated disruption. Characterization of particles by using X-ray diffractometry (XRD) and differential scanning calorimeter (DSC) show that reduction of particle size in the sample was indicated by low intensity and also low of melting behaviour respectively and there is no changes in polymorph and particles remain as form I. Using electrospray drying, will increase the surface- to-volume ratio by decreasing the product size and also offers a novel way to particles for drug formulation solving formulation problems of drugs with low solubility in class II of the Biopharmaceutical Classification System.