

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
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& design  
exposition 2014

INNOVATEUR  
wannabe!  
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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**RESEARCH INNOVATION BUSINESS UNIT**  
UiTM-MTDC Technopreneur Centre, Universiti Teknologi MARA  
40450 Shah Alam, Selangor Darul Ehsan, MALAYSIA  
Tel : +603-5544 2747/2748/2750  
Fax : +603-5544 2790

Web : [www.iiindex.com.my](http://www.iiindex.com.my)  
Email : [iiindexuitm@gmail.com](mailto:iiindexuitm@gmail.com)



## 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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## COMBATING BACTERIA VIA SILVER-DAMMAR COATING

Azizah Hanom Binti Ahmad, Aisyah Binti Nor Hasnan, Fatin Nabella Binti Zulkefli  
Institute of Science (IOS), UiTM Shah Alam, Selangor.

*Email: azizahanom@salam.uitm.edu.my*

Coating systems are formulated using a mixture of dammar, silver and nanoclay in varied compositions. Generally the problems in the coating area are poor coating quality, poor adhesion, long curing time period, corrosion attack, attachment or bacteria attack which could also cause corrosion attack which is called as Microbiologically Influenced corrosion (MIC). These disadvantages of coating system and coating surface could lead to coating failure thus leading to substrate damage especially metal substrate. Materials: Dammar or triterpenoids resin is natural resins which can be isolated or obtained from plants that belong to the family Dipterocarpaceae sp. Dammar is well known for its glossy properties and the plant can be found abundantly in Sarawak, Malaysia. Thus it can be used in the coating industry. The role of dammar is to improve the adhesion property, self cleansing property and shorten the coating curing time. Silver nitrate has quite a long history of usage as antibacterial agent. Silver possesses good antibacterial activity. The addition of silver onto the coating system, introduces the antimicrobial property for the coating system. It is used in a variety of application for example as protective coating for concrete, brick, wood, metal and others. It is considered as a good anti-microbial coating due to its low toxicity to where the toxicity is lower than of bacteria. However, the antibacterial activity depends on the Ag<sup>+</sup> ions released by the silver. If it is too high, it will result in cytotoxicity. Thus to overcome this problem nanoclay was added into the coating system. Clay is a good absorbent which belongs to the phyllosilicate group. In this case Montmorillonite clay was used as the absorbent. Montmorillonite clay form could absorb compound and store it in the pore without leaching out the compound to the surrounding environment. Methodology: In this research work, the polyol is modified by using a solvent and mixed with dammar in varied compositions. Silver nitrate is incorporated into the optimum composition of polyol-dammar, followed by a small amount of Nano clay is dispersed into the modified Silver-polyol-dammar mixture. Then the paint mixture is spin coated onto polished Aluminium Q-panel as a substrate and is left to dry at room temperature. This research describes the characteristics of the dammar based paint system. Adhesion property is evaluated by using crosshatch test and pull-off test. The crosshatch test method is based on ASTM D3359 standards. The wettability property of coating is characterized by using contact angle measurement. The resistances of paint systems are also described against microbial activity by using disc diffusion and agar well diffusion method. Results: The result of crosshatch and pull-off test shows that the coating system containing 50 wt. % of dammar (50 PD) exhibits an excellent adhesion property. The addition of dammar to polyol helps to increase the contact angle measurement up to approximately 50 degree. The antimicrobial activity of silver nanoclay coating was demonstrated by using disc diffusion and agar well diffusion method. The antimicrobial activity was evaluated against a few negative gram bacteria and positive gram bacteria. *K. pneumoniae*, *E. coli*, *S. aureus*, *P. aeruginosa* and *B. subtilis*. Moreover it is also tested against fungi, *C. albicans* (fungi). The largest inhibition diameter zone against *E. coli* and *S. aureus* is obtained for the silver nanoclay polyol dammar, namely PDS3 coating system.