

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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CORROSION INHIBITION STUDIES ON NEWLY SYNTHESIZED METHYLBENZOYLTHIOUREA DERIVATIVES

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Corrosion in acidic media occurs due to industrial processes such as acid pickling, acid cleaning and oil well acidizing. As mild steel is commonly used structural material in those processes, it is more susceptible to corrosion. This is because the general aggressiveness of the acid solutions makes it easy for the corrosive attack on the metal surfaces. Thus, to reduce the attack on mild steel surfaces, organic inhibitors is used as one of the most effective and practical methods. According to Ghailane et. al., (2013) studies, organic compounds contain nitrogen, oxygen, sulphur and/or phosphorus atom in their structure are the most efficient inhibitors. The inhibitors which have both nitrogen and sulphur atoms simultaneously like thiourea provide a better inhibition performance. This statement is supported by previous research by Li and his co-workers on allyl thiourea as corrosion inhibitor for rod steel (2012). Apart from that, the presences of aromatic rings in the compounds make it more effective inhibitors in acid solutions. Others investigation states that heterocyclic ring structure which contains nitrogen and oxygen atoms can enhance greater adsorption on metal surface (Chauhan et.al., 2009). Therefore, heterocyclic structure of thiourea is the best organic compound that can be used as the corrosion inhibitor. In this study, a series of thiourea derivatives having two aromatic rings in the chemical structure were synthesized and applied as corrosion inhibitors in order to investigate the inhibition efficiency of the compounds. Four novel corrosion inhibitors, namely N-(2-methoxyphenyl)-N(2-methylbenzoyl) thiourea (A1), N-(3-methoxyphenyl)-N-(2-methylbenzoyl)thiourea (A2), N-(4-methoxyphenyl)-N-(2-methylbenzoyl)thiourea (A3) and N-(2-methylbenzoyl)-N -phenylthiourea (A4) were successfully synthesized from 2-methylbenzoylthiocyanate and different isomers of methoxyaniline and aniline itself. These compounds were positively identified using CHNS elemental analyser, Fourier Transform Infra Red (FTIR) , ^1H and ^{13}C Nuclear Magnetic Resonance (NMR) spectroscopies. The FTIR spectra showed the important bands of interest such as $\hat{\nu}_{\frac{1}{2}}(\text{N-H})$, $\hat{\nu}_{\frac{1}{2}}(\text{C=O})$, $\hat{\nu}_{\frac{1}{2}}(\text{C-N})$ and $\hat{\nu}_{\frac{1}{2}}(\text{C=S})$ which were observed around 3200 cm^{-1} , 1670 cm^{-1} , 1250 cm^{-1} and 700 cm^{-1} . The ^1H chemical shifts for C-ONH and C-SNH had been observed around 11 ppm and 12 ppm while the ^{13}C resonance, the signal of C=O and C=S had been observed at 170 ppm and 180 ppm, respectively. The inhibitive capabilities of each inhibitor were studied on corrosion of the mild steel in 1 M H_2SO_4 . The efficiencies of the inhibitors were investigated by means of weight loss and linear polarization resistance (LPR) measurements with different concentration of inhibitors. The treatment was achieved by immersion of mild steel coupons in 1.0 M sulphuric acid solutions with variable concentrations of the compounds ranging from $1 \times 10^{-3}\text{ M}$ to $1 \times 10^{-5}\text{ M}$. Results showed that, the presence of the inhibitors significantly reduced the corrosion rate of the mild steel. From the study, it was found that, as the concentration of the inhibitors increased, the inhibition efficiency also increased. Out of four inhibitors, compound A1 shows better inhibition efficiency than the others with the highest percentage of 82.4% at $1 \times 10^{-3}\text{ M}$ concentration. The effectiveness of these inhibitors decreased in the order of $\text{A1} > \text{A3} > \text{A4} > \text{A2}$ and it is suggested that the efficiency of the inhibitor is depend on the nature of the substituent present in the molecule compound.