UNIVERSITI TEKNOLOGI MARA

PHYSICOCHEMICAL AND ELECTROCHEMICAL PROPERTIES OF MESOPOROUS SILICA -CARBON ELECTRODE

NORAMIRA BINTI SAAD

MSc

July 2020

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Postgraduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Noramira binti Saad
Student I.D. No.	:	2016774799
Programme	:	Master of Science (Applied Chemistry) – A757
Faculty	:	Applied Sciences
Thesis Title	:	Physicochemical and Electrochemical Properties of Mesoporous Silica Carbon Electrode
Signature of Student	:	amirasaad ……..
Date	:	July 2020

ABSTRACT

Lack of explanation in correlation between materials structure and the electrochemical behaviours becoming a growing concern. In this study, the aims are to synthesise and characterise the physical properties of the mesoporous silica Santa Barbara Amorphous-15 and -16 (SBA-15 and SBA-16) and, followed by fabrication of mesoporous silica-carbon electrode (MCPE) and investigate the electrochemical behaviours. The mesoporous SBA-15 and SBA-16 were synthesized via surfactant templating approach using triblock copolymer P123 and F127 as directing agent and tetraethyl orthosilicate (TEOS) as silica source. The synthesized materials were characterized by X-ray diffraction (XRD), infra-red spectroscopy (IR), thermal gravimetric analysis (TGA), scanning electron microscopy (SEM) and nitrogen absorption-desorption tests. The pore diameters were 5.5 nm and 3.2 nm for SBA-15 and SBA-16 respectively, determined with BJH method based on adsorption data. Three different electrodes were fabricated, carbon paste electron (CPE) and two modified carbon paste electrodes (MCPE): SBA-15/MPCE and SBA-16/MPCE. The fabricated electrodes were tested using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The addition of mesoporous silica to the carbon electrode improved the electrochemical behaviors of the electrode formation of microelectrode thus enhanced migration of the electrons. The SBA-16/MCPE showed better adsorption, response signal and a lower resistance compare to SBA-15/MCPE due to 3D cubic structure of SBA-16 which provide better electron pathway than SBA-15 2D hexagonal structure.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my master's degree and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr Mohammad Noor bin Jalil and my co-supervisor, Dr Zaini Haryati Mohd Zain.

My appreciation goes to the Faculty of Applied Sciences and Institute of Sciences who provided the facilities and assistance. Special thanks to my family, colleagues, friends and my best friend Halina Omar for unwavering advice and support.

Finally, this thesis is dedicated to everyone that involve directly and indirectly through This piece of victory is dedicated to all of you of you. Alhamdulillah.

TABLE OF CONTENTS