UNIVERSITI TEKNOLOGI MARA

# PREPARATION AND CHARACTERIZATION OF NANOSILICA RICE HUSK ASH (RHA)/LINEAR LOW DENSITY POLYETHYLENE (LLDPE) COMPOSITES

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Thesis submitted in fulfilment
of the requirements for the degree of
**Master of Science**

**Faculty of Applied Science**

**September 2014**

## AUTHOR DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulation of University Teknologi MARA. It is original and is the result 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 other degree of qualification.

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

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## ABSTRACT

Rice husk is an agro-waste material that contains high source of silica, non-toxic and environmental friendly. Rice husk disposal has become a major problem in rice producing country. Rice husk can be used as natural filler for more potential application as well as to maximize the usage of renewable resources. Nanosilica powder was produce from white rice husk ash by controlled firing method at 700 °C at low heating rate of 5 °C /min for 6 hours then followed by precipitation method using alkali treatment of 2N sodium hydroxide. Nanosize silica particles below 100nanometer were produced and used as nano filler in compounding process of Linear Low Density Polyethylene. Two coupling agent were used, triacetoxyvinylsilane and maleated styrene–ethylene–butylene–styrene (SEBS-g-MA), to study the compatibility effects of powder/filler interaction while control set of samples without coupling agent was also used as comparisons. Counter-rotating twin screw extruder was used in the compounding process of the nanocomposites. The samples were characterized by using Fourier Transfer Infrared, Thermal Gravimetric Analysis, Differential Scanning Calorimetry, Field Emission Scanning Electron Microscopy and Transmission Electron Microscope. Permeability, morphology and tensile properties of nanocomposite samples were also investigated. It was found that silane treated sample gives very good dispersion and yields high tensile modulus as well as good water vapor permeability. However sample with SEBS-g-MA exhibit lower value oxygen permeability. The investigation was successful in providing such interesting set of data for a new class of nanomaterial obtained from rice husk ash powder.

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