

CHARACTERIZATION AND GEOTECHNICAL
PROPERTIES OF COAL ASH MIXTURES MODIFIED
SODIUM LAURYL SULPHATE

by

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Report submitted in partial fulfillment
of the requirements for the degree
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APPROVAL AND DECLARATION SHEET

This project report titled “Characterization and Geotechnical Properties of Coal Ash Mixtures Modified Sodium Lauryl Sulphate” was prepared and submitted by Hong Puan Yee (Matric Number : 101200298) and has been found satisfactory in terms of scope, quality and presentations as partial fulfilment of the requirement for the Bachelor of Engineering (Civil Engineering) in University Malaysia Perlis (UniMAP).

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PENCIRIAN DAN SIFAT GEOTEKNIKAL PENGUBAHSUAI CAMPURAN ABU TERBANG AND ABU DASAR DENGAN SODIUM LAURYL SULPHATE

ABSTRAK

Kebanyakan stesen jana kuasa pembakaran arang batu menghasilkan sisa produk selepas proses pembakaran seperti abu terbang dan abu dasar dengan nisbah pengeluaran anggaran 90 % abu terbang dan 20 % abu dasar. Sebelum ini kebanyakan sisa pembakaran arang batu terutamanya abu terbang yang terperangkap dalam gas serombong tidak diuruskan dengan baik telah disebarkan melalui udara. Sementara itu abu dasar dibuang di kawasan tanah tanpa sebarang rawatan. Dalam aspek lain, penggunaan abu arang batu sebagai pengisi mineral dalam polimer dihalang oleh pengagregatan zarah abu dan kekurangan interaksi antara abu dan polimer. Justeru, tujuan kajian ini adalah mengubahsuai pencirian permukaan abu arang batu Jana Manjung oleh Sodium Lauryl Sulphate (SLS), dan menerangkan sifat-sifat geoteknik produk. Tiga campuran abu terbang dan abu dasar dengan nisbah yang berbeza campuran (25% , 50% dan 75% kandungan abu terbang mengikut berat) akan disediakan untuk kajian. Sifat-sifat produk diubahsuai telah dibandingkan dengan sampel yang tidak dirawat dengan menggunakan beberapa teknik analisis dan fizikal seperti Ujian Pemadatan Proctor, Ujian Pemadatan Tidak Terkurung, Imbasan Elektron Mikroskop (SEM) dan X -ray Belauan (XRD) untuk mengkaji peningkatan ciri- ciri abu yang diubahsuai. Secara umumnya, selepas pengubahsuaian campuran abu arang batu dengan SLS. Kekuatan ricih dan perpaduan abu arang batu itu telah meningkat. Tahap pengumpulan juga sudah mula berkurangan selepas pengubahsuaian, zarah abu terbang telah pecah dan tersebar. Kebanyakan keputusan menunjukkan bahawa surfaktan itu telah megubah ciri-ciri abu terbang dan abu dasar.

CHARACTERIZATION AND GEOTECHNICAL PROPERTIES OF COAL ASH MIXTURES MODIFIED SODIUM LAURYL SULPHATE

ABSTRACT

Most of coal-burning power plant produced residue by-products after burning process such as fly ash and bottom ash with approximate production ratio of 90% fly ash and 20% bottom ash. Previously most of the coal burning wastes especially the fly ash was not managed properly as it were dispersed through the air after it has been entrained in flue gases. Meanwhile the bottom ash as dumped on land area without any treatment. In other aspect, the application of coal ash as mineral filler in polymers hampered by the aggregation of the ash particles and lack of interaction between the ash and polymer. The aim of this study is on the characterization of the surface of a typical Jana Manjung coal ash modified by Sodium Lauryl Sulphate (SLS), and elaborates the geotechnical properties of the product. Three mixtures of fly ash and bottom ash with different mixture ratio (25 %, 50 % and 75 % fly ash content by weight) were prepared for testing. The properties of the modified products were compared to those of the untreated samples by using some analytical and physical techniques such as Proctor Compaction Test, Unconfined Compaction Test, Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD) to investigate the improvement of the modified ash. Generally, after the modification of coal ash mixture with SLS the shear strength and cohesion of the coal ash had increase in a significant value. The degree of agglomeration also had reduced after the modification, the particles of the fly ash had break and spread out. Most of the results showed that the surfactant had improved the properties of fly ash and bottom ash

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LIST OF ABBREVIATIONS

AASHO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
atm	Atmospheric Pressure
cm	Centimetre
cm ³	Centimetre Cube
F°	Fahrenheit Degrees
ICDD	International Committee of Diffraction Data
g	Gram
in.	Inch
kg	Kilogram
kPa	Kilo Pascal
lb	Pound
LOI	Loss-On-Ignition
ml	Millilitre
mm	Millimetre
SDS	Sodium Dodecyl Sulphate
SEM	Scanning Electron Microscope
SLS	Sodium Lauryl Sulphate
TNB	Tenaga Nasional Berhad
UCT	Unconfined Compression Test
XRD	X-Ray Diffraction
°C	Celsius
µm	Micrometer
%	Percentage
θ	Degree