CHARACTERISATION OF LIGNITES FROM OHORDUA AND AZAGBA-OGWASHI AND THEIR EXTRACTED HUMIC ACIDS: SUITABILITY FOR SOIL BENEFICIATION/CONDITIONING.

PRESENTED

BY

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(Mineral Exploration Option)

DEPARTMENT OF GEOLOGY

FACULTY OF PHYSICAL SCIENCES

UNIVERSITY OF BENIN

IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF THE AWARD OF DEGREE OF MASTER OF SCIENCE (M.Sc) IN GEOLOGY (MINERAL EXPORATION)

APRIL, 2019

CERTIFICATION

This is to certify that this project work described in this thesis was carried out by Abdulmajeed, OCHU, in the Department of Geology, Faculty of Physical Sciences, University of Benin, Benin-City, Edo State, Nigeria, under the supervision of Professor Asuen, G. O.

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PROF. ASUEN G.O. **DATE**
PROJECT SUPERVISOR

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PROF. AKUJIEZE C.N. **DATE**
HEAD OF DEPARTMENT

DEDICATION

With the whole of my being, I dedicate this work to the Almighty God for His unmerited favour bestowed on me to soar high above every challenges, ensuring that this work sees the light of day.

ACKNOWLEDGEMENT

To God Almighty, the giver of life, strength and wisdom. The whole appreciation in the entire universe would never measure up to your loving-kindness and tender-mercies. My big appreciation goes to Professor Asuen, G.O, who stood by me through thick and thin, to ensure a good quality output. I am grateful sir for your fatherly guidance. Also, to the Head of Department, Prof. Akujieze C.N for his mental prowess and intellectual sagacity in ensuring the smooth running of the post graduate programme. . I also acknowledge Dr. Imasuen, O.I., for standing by me when I needed him most, who was also my course Lecturer; I am sincerely grateful sir. May God continually bless and protect you. To Dr. Salami, I sincerely appreciate you sir for teaching me diligence, persistence and focus I sincerely learnt from your humility. I acknowledge my external supervisor,. Also to a man whom I can't eliminate out even in my sleep, Mr Festus; I thank you for your direction, knowledge and input in the success of this project Your cheerful nature had endeared many to you. Special thanks to Dr (Mrs) Ariyo of Federal University Otuoke, for her moral support, indeed you have been a mother to me.To my colleagues and friends Mr. Bassey, Mr Ayo, Mr Oziggy, Mr Ejiro ,Mr Odia, Mr Julius, Mr Osazie, Mr Precious,Mr Bode, Mr Isreal Bamang, Miss Amaka, Miss Osas, Miss Faith andMiss Janet.Also my sincere thank you goes to the Head of Department, Physics FUO and all staff of Physics Laboratory Unit FUO.A very big appreciation to my wonderful parents, Mr and Late (Mrs) Ochu Suleiman. To my loving and lovely Sister Late (Mrs) Salihat Ochu and my one and only brother Ochu Muhydeen, you all mean so much to me. Special acknowledgement to my spiritual parents, Pastor and Pastor (Mrs) Mike Daniel, whose teachings and impartations had risen the giant in me, your prayers, advice and support I can't understimate. I also want to acknowledge Pastor and Pastor (Mrs) Egede Emmanuel who have also been a medium of inspiration and advice to me. I love you all.

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LIST OF ABBREVIATIONS

HA (Humic acid)

CEC (cation exchange capacity)

C (Carbon)

H (Hydrogen)

N (Nitrogen)

S (Sulphur)

O (Oxygen)

OH (Ohordua)

AO (Azagba-Ogwashi)

LOC (Location)

ABSTRACT

This research gives attention to the non-energy use of Lignite samples collected from Ohordua town of Edo State and Azagba-Ogwashi in Delta State. A total of six composite Lignite samples,from ten sampled points were subjected to analytical study, with a view to determining their humic content and properties for use in soil beneficiation and conditioning.Proximate and Ultimate analytical technique was used to characterize the lignite from which humic acid was extracted under alkaline condition, and precipitated using acidic medium of 6M HCl.X-Ray Diffraction and X-Ray Fluorescence analytical methods were employed to determine the mineralogical and elemental composition of the samples respectively,while Ultra-Violent visible spectroscopy was used for organic characterization of the humic acid.Proximate analyses of the Lignite show percentage composition of Ohordua and Azagba-Ogwashi Lignite respectively,Fixed Carbon (65.22 wt% and 67.16wt%),Moisture Content (26 wt% and 25.4wt%) and Ash (5.02 wt% and 4.5 wt%).Ultimate analyses shows Hydrogen (6.60 wt% and 6.22wt%), Nitrogen (1.34 wt% and 1.19wt%,) Sulphur (0.77 wt% and 0.70wt%), Oxygen (26.07 wt% and 24.73 wt%), for Ohordua and Azagba-Ogwashi respectively.The analytical results suggest the existing lignite with varying thickness is of Lignite rank. The Ultimate analyses of the extracted Humic acid show Carbon (57.5wt% and 55.8wt%)%, Hydrogen (5.1 wt% and 3.9wt%), Nitrogen (2.5 wt% and 1.1wt%), Sulphur (Nil and 0.3wt%) and Oxygen (34.9 wt% and 38.9wt%,) for Ohordua and Azagba-Ogwashi, respectively.The mineralogical composition in the lignite samples shows Kaolinite was the main clay mineral identified. Non clay minerals such as anorthite, drierite, yeelimite, spurite, belite, wollastonite, hematite, pyrite, bauxite and quartz were detected.For Ultra-Violent visible spectroscopy characterization of the Humic Acid, E_2/E_3 and E_4/E_6 absorption values for Ohordua (21.69 and 4.50) respectively, while Azagba-Ogwashi reveal (19.39 and 4.6) respectively. The humic substance has percentage aromaticity values of 33.90% and 34.06%, total acidity has 10.4% and 10.1%, COOH has 3.4% and 3.3%, Phenolic has 7.0% and 6.8% and acidity ratio has 0.49% and 0.48%, for Ohordua and Azagba-Ogwashi, respectively which depicts the Humic Acid has a high degree of Humification and a very good total acidity ratio. Results from this research indicate that the Lignite from both locations are similar in geochemistry, mineralogy and organic properties. Although,humification is high in both samples, Ohordua Lignite with lesser aromaticity and E4/E6 ratio, higher E2/E3 ratio and higher acidity ratio is more suitable for soil beneficiation and conditioning than that of Azagba-Ogwashi.

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