Available online at www.asric.org
ASRIC Journal on Engineering Sciences 1 (2023) 19-28

Processing of Black Board Chalk from Pachymelania Aurita and Lanister Variscus Shells

Unyime Enobong Okure[1*], Abasiofon Ime Moses[2], Alìck Muvundika[3], Victoria Enobong Okure[4]

[1]Dept of Chemical Engineering, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria
[2] Dept of Chemical and Petroleum Engineering, University of Uyo, Nigeria
[3]Dept of Water, Energy and Environment, National Institute for Scientific and Industrial Research, Nigeria
[4] Dept of Biochemistry, University of Uyo Akwa Ibom state, Nigeria

*Corresponding author: Unyime Enobong Okure; Email: okureunyime@gmail.com

Received 2 July 2022; revised 21 July 2022; accepted 22 August 2022

Abstract

A mixture of marble dust and periwinkle shells (achymelania Aurita) and a mixture of marble dust and snail (LanisterVariscus) shells were used to replace the conventional calcium carbonate (CaCO3) used for the production of classroom chalk. The bulk density for the crushed periwinkle shells and crushed snail shells at a particle size of ≤63µm were 1.14g/ml and 1.12 g/ml respectively. From the results obtained from the complexometric titration, the percentage composition of calcium carbonate (CaCO3) content in crushed periwinkle shells and crushed snail shells were 85.06% wt. and 85.91% wt. respectively. The quality of chalk produced from the mixture of marble dust (MD) and crushed periwinkle shells (CPS) at at a ratio of 1:3 was high with a breaking strength of 56.4 kg/cm2. The result from the mixture of marble dust (MD) and crushed snail shells (CSS) at a ratio of 1:3 was also high with a breaking strength of 54.7 kg/cm^2. The results obtained show that the mixture of marble dust and crushed periwinkle shells at ratio of 1:3 and a mixture of marble dust and crushed snail shells at a ratio of 1:3 could replace the conventional calcium carbonate for classroom chalk production.

Key words: PachymelaniaAurita, LanisterVariscus, complexometric, marble dust, snail, periwinkle shells, marble dust

1.0 INTRODUCTION

1.1 Background of the study

Chalk is a form of limestone and is composed of the mineral-calcite (Geology Science, 2021). Chalk is a form of limestone comprised primarily of the mineral calcite (Geology Science, 2021). Chalks (dusty and dustless) are frequently composed primarily of limestone (CaCO3) or gypsum (a dehydrated form of CaSO4) (Maruthi et. al., 2015). Chalk was obtained through the quarrying of limestone, another type of carbon carbonate (CaCO3). This limestone mining has had a detrimental effect on the environment. Lamare and Sigh (2017) highlighted that this technique resulted in landscape alterations and degradation of agricultural land, denudation of forest, water depletion, contamination of water, soil, and air, depletion of natural flora and fauna, soil erosion, and instability of soil and rock masses.

According to Fabricius (2007), chalk is a material with a broad range of technical applications, including use as a raw material for cement, a means of managing soil acidity and neutralizing acid gasses created in power plants, a filler in paper and plastic, and a white pigment. Chalk has long been used in educational

Fabricius, I. L. (2007). Chalk: composition, diagenesis and physical properties. *Geological Society of DenmarkBulletin*, 55:97-128.

Ganesh, M., and Danish, P. (2019). Effect of waste marble dust content as filler on properties of self-impacting concrete. *Journal of Advanced Research in Dynamical and Control Systems,* 11(2):2254-2260.

Gemechu, B. (2014). Optimization of Gypsum Processing parameters for the Production of Improved Quality Chalk. *M. Sc. Thesis,*School of Graduate Studies of Addis Ababa University, Institute of Technology.

Geology Science. (2021). Chalk. Available at: https://geologyscience.com/rocks/sedimentary-rocks/chalk/**, Accessed on: 2nd April 2021.**

Kolawole, M.Y., Aweda, J. O., and Abdulkareem, S. (2017). Archachatina Marginata bio-shells as reinforcement materials in metal matrix composites. *International Journal of Automotive and Mechanical Engineering*,14(1):4068 - 4079.

Lamare, R. E., and Sigh, O. P. (2017). Limestone Mining and its Environmental Implications in Meghalaya, India. *Envis Bulletin Himalayan Ecology,* 24:87-100.

Maruthi, Y. A., Das, N. L., Ramphrasad, S. Ram, S. S., and Sudarshan. M. (2015). Trace elemental analysis of school chalk using energy dispersive X-rayflorescence spectroscopy (ED-XRF). *4th National Conference on Advanced Materials and Radiation Physics, Sant Longowal Institute of Engineering and Technology, India,* 030088:1-3.

Mishra, G. (2016). The constructor-civil engineering. https://theconstructor.org/practical-guide/digital-compression-testing-machine/6066/, Accessed on: 27th April, 2021.

Orji, B. O., Igbokwe, G. E., Anagonye, C. O., and Modo, E. U. (2017). Chemical content of the Perewinkle Shells and its suitability in thin layer Chromatography. *International Journal of Chemistry Studies*,1(2):09-11.

Pooja, J. C., and Bhole, S. D. (2014). To Study the Behaviour of Marble Powder as Supplementry Cementitious Material in Concrete. *International Journal of Engineering Research and Applications*, 4(4):377-381.

Rajendra, S. T., Jignesh, J. S., Girish, R. D., and Pushpito, K. G. (2017). Understanding the factors influencing quality of writing and wiping for chalk and board system. *Article in Current science,* 112(8):1727-1737.

Rao, V.K., Kumar, J.S.K., Reddy, M.V.B., and Murthy, C.V.N. (2016). Determination of Calcium Content in Shells of gastropod snails Ramayapatnam beach of Andhra Pradesh. *Journal of Chemical and Pharmaceutical Research*,8(8):577-580.

Sakalkale, A. D., Dhawale, G.D., and Kedar, R.S. (2014). Experimental Study on Use of Waste Marble Dust in Concrete. *International Journal of Engineering Research and Applications*,4(10):44-50.

Serra, R. (2006). Dictionary of Geology. *Academic (India) Publishers, New Delhi* – 110008.

Sezer, N. (2013). Production of precipitated calcium carbonate from marble wastes. *Thesis for Master of Science in Mining Engineering Department,* Middle East Technical University, Turkey.

Sobhi, N. (1996). Mineralogy, petrography and manufacturing of good quality blackboard chalks. *Qatar University Science Journal*,6(2):325-331.

Timothy, S., Anthony, N., Gideon O. B., and David, O. O. (2016). The study of periwinkle shells as fine and coarse aggregate in concrete works. *3rd International conference on African Development issues (CU-ICADI), Covenant University, Ota*,pp. 361-364.

Tobins, F. H., Abubakre, O. K., Muriana, R. A., and Abdulrahman, S. A. (2018). Snail Shell as an Inspiring Engineering Material in Science and Technology Development: A Review. *International Journal of Contemporary Research and Review*, 9(3):20408-20416.

Udoh, M. R. (2019). Production of classroom chalk from periwinkle (*Tympanotonus fuscatus*) shell. B.Eng. Final Year Project. *Department of Chemical and Petroleum Engineering*, University of Uyo, Uyo.

White, M. M., Chejlava, M. Fried, B., and Sherma, J. (2007). The concentration of calcium carbonate in shells of freshwater snails. *American Malacological Bulletin,* 22:139-142.

World Health Organization (WHO). (2012). Bulk density and tapped density of powders.*The International Pharmacopoeia*, 4:01-06.

Zakaria, B. K., Houddaserrar, Said, B., Brahim, S., and Abdelaziz, S. (2016). Snail shells as a new natural and reusable catalyst for synthesis of 4H-Pyrans derivative. *Current Chemistry Letters,* 5:100.