Characterisation of Polymesoda bengalensis Shell Powder

Mahshuri Yusof[a,*], Nur Tahirah Razali[a], Marini Sawawi[a], Nicholas Kuan Hoo Tien[a] and Dexter Sigan anak John[b]
[a]*Department of Mechanical and Manufacturing Engineering, Faculty of Engineering,*
[b]*Faculty of Language and Communication,*
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

Abstract

Seafood shell is abundant and has no eminent use and thus, commonly regarded as waste. Reusing and converting it into a useful material can decrease the amount of waste. Therefore, a study of the crystalline structure should be performed before identifying the potential use of the material. The aim of this study is to identify the element and polymorph of Polymesoda bengalensis shell. The characterisations involved the usage of X-ray powder diffraction (XRD), scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDX). The XRD study revealed that the shell powder mostly consisted of aragonite. The analysis from SEM also revealed that the aragonite was in the form of rod-like crystal. The morphology of sectional, inner and outer surfaces of the shell was s found that the aragonite was arranged in the form of a cross-lamellar structure of various sizes. The elemental content of the shell showed that $CaCO_3$ in this shell contained large amounts of calcium and carbon.

Keywords: *Polymesoda bengalensis, Clam Shell, Polymorph; Aragonite.*

1. Introduction

Calcium carbonate ($CaCO_3$) can be obtained either by mining processes from limestone or from biological resources such as seashells and eggshells. Its powder is mostly used in industrial applications such as paper, inks, plastics and medicines [1]. In composite production, $CaCO_3$ is one of the widely used fillers infused in the plastics matrix composite [2].

Basically, $CaCO_3$ has three types of polymorph: calcite, aragonite and vaterite [3]. Commercial $CaCO_3$ from limestone is in the form of calcite[4]. Calcite can be found in Strombidae shell such as *Crassostrea gigas* [5] and *Strombus gigas* [6], and at the outer layer of several bivalves [7, 8], such as Pterioida and Mytiloida [9, 10]. Natural aragonite is of biogenic origin and it is denser than calcite.. Due to its higher density and biocompatibility, aragonite is suitable for producing scaffold to repair fractured bone [11]. It can also be produced in the lab but in a small quantity [12]. Vaterite is a metastable $CaCO_3$ that has been detected in the upper layer and at the surface of freshwater cultured pearls [13]. Currently, calcium carbonate polymorph can be synthesised in the lab under a controlled environment in terms of, for example, temperature [14] and chemical solution [15].

This research investigates the characteristics of *Polymesoda bengalensis* shell and its powder. The findings from this research is beneficial for industrial application such as in wastewater treatment and biomaterial. The finding is also provide a green resource due to the conversion of waste to a

* Corresponding author. Tel.: +60-82-583289; fax: +60-82-583410
E-mail address: ymashun@unimas.my

Manuscript History:
Received 22 April 2020, Revised 30 April 2020, Accepted 30 April 2020, Published 30 April 2020

e-ISSN: 2289-7771