Synthesis and Characterization of Hydroxyapatite from Biowaste for Potential Medical Application

Mohammad D.H. Beg*, John O. Akindoyo, Suriati Ghazali and Nitthiyah Jeyaratnam

Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang Lebuhraya Tun Razak, Gambang 26300, Kuantan, Malaysia.

***Correspondence**: M.D.H. Beg, email: dhbeg@yahoo.com; Phone: +6019504590; Fax: +6095492816)

ABSTRACT: Over the period of time, several approaches have been undertaken to mitigate the challenges associated with bone regeneration. This includes but not limited to xenografts, allografts, autografts as well as artificial substitutions like bioceramics, synthetic cements and metals. The former three techniques often come along with peculiar limitation and problems such as morbidity, availability, disease transmission, collateral site damage or absolute rejection by the body as the case may be. Synthetic routes remain the only feasible alternative option for treatment of bone defects. Hydroxyapatite (HA) is very compatible and suitable for this application. However, most of the common methods for HA synthesis are either expensive, complicated or environmentally unfriendly. Interestingly, extraction of HA from bio-wastes have been perceived not only to be cost effective, but also environment friendly. In this research, HA was synthesized from bio-waste: namely bovine bones through three different methods which are hydrothermal chemical processes, ultrasound assisted synthesis and ordinary calcination techniques. Structure and property analysis of the HA was carried out through different characterization techniques such as TGA, FTIR, and XRD. All the methods applied were able to produce HA with similar compositional properties to biomaterials found in human calcified tissues. Calcination process was however observed to be more efficient as it eliminated all the organic components from the produced HA. The HA synthesized is unique for its minimal cost and environmental friendliness. It is also perceived to be suitable for tissue and bone engineering applications.