Synthesizing a Bone Ash Substitute Using Locally Available Eppawala Apatite

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Bone china is considered as the highest-grade porcelain with incomparable features due to the presence of bone ash as its main ingredient. But, as bone ash is sourced from animal bones; compositional variations, presence of high iron contents, and dissent of the vegetarians have become significant issues. Further, the local mineral resources with conformable compositions to bone ash have drawn less attention. So, an attempt was taken to synthesize a bone ash substitute using locally available Eppawala Apatite. Three products were synthesized by heat-treating apatite with calcium hydroxide ($Ca(OH)_2$) at different temperatures; 700, 800, and 900 ^{0}C. The samples were characterized by Fourier Transform Infrared (FTIR), X-Ray Diffraction (XRD) and X-Ray Florescence (XRF) analytical techniques. A test ceramic ware was manufactured using the synthesized product to investigate its practical viability. A reference ceramic ware was produced using commercially available bone ash. The FTIR spectrums indicated that all the synthesized samples have the characteristic PO_4^{3-} and OH^- functional groups, of commercially available bone ash. The XRD analysis revealed that the samples have the inherent hexagonal crystal structure. The XRF analysis suggested that the samples have appropriate elemental compositions. Even though it is attainable to synthesize bone ash at 700, 800, 900 ^{0}C, the product that was heat-treated to 900^{0}C, has the highest purity level with the best crystallinity and has the most appropriate elemental composition with least amounts of fluorine, chlorine, and iron. Also, the heavy metal free product could be denoted as safer, inexpensive raw material. The test ceramic ware expressed similar whiteness levels and higher strength compared to the reference ceramic ware. So, it can be suggested that it is possible to synthesize a bone ash substitute by treating Eppawala Apatite with $Ca(OH)_2$ at 900 ^{0}C.

Keywords: Bone china, Bone ash, Eppawala Apatite