

KSUC-OI-004

The effect of hydroxyapatite adding and sintering temperature on physical properties of ceramic produced via rapid prototyping

Kridsada Faksawat¹, Weeranut Kaewwiset² and Kittisakchai Naemchanthara^{1,*}

¹Department of Physics, Faculty of Science, King Mongkut's University of Technology Thonburi, 126 Pracha-Uthit Rd., Bangmod, Thung Khru, Bangkok, 10140, Thailand

²Department of physics, Faculty of Liberal Arts and Science, Kasetsart University, Kamphaeng Saen Campus, 1 Malaiman Rd., Kamphaeng Saen, Nakhon Prathom, 73140, Thailand

*Corresponding author: Puri_kit@hotmail.com

Abstract

The aim of this is to study effect of hydroxyapatite adding on physical and mechanical properties of ceramic. The ceramic was firstly produced from commercial clay and adding of the synthesized hydroxyapatite from chicken eggshell in commercial clay was various concentration from 5 wt.% until to 20 wt.%. Then, the green samples were cast via rapid prototyping process. The physical properties of sintered sample were researched by X-ray diffractometer (XRD) and universal testing machine (UTM). The results demonstrate that the adding of high hydroxyapatite concentration occur to rapidly high shrinkage of the sintered sample. The sintered sample has a homogenous microstructure and no interface between the printed layer and line was observed. The crystal phase of clay was rapid transformed from the metakaolin ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$) to the both cristobalite (SiO_2) and anorthite ($\text{CaAl}_2\text{Si}_2\text{O}_8$) phases. The strength of samples increases gradually with increasing of sintering temperature. On the other hand, the strength of sample with hydroxyapatite content of 20 wt.% increase dramatically from 40.21 MPa (sintered at 1100 °C) to 88.01 MPa (sintered at 1200 °C). This experiment indicate that the synthesized hydroxyapatite could be enhance the physical properties of ceramic and used as a fluxing agent for ceramic industries.

Keywords: ceramic, chicken eggshell, hydroxyapatite, rapid prototyping, sintering