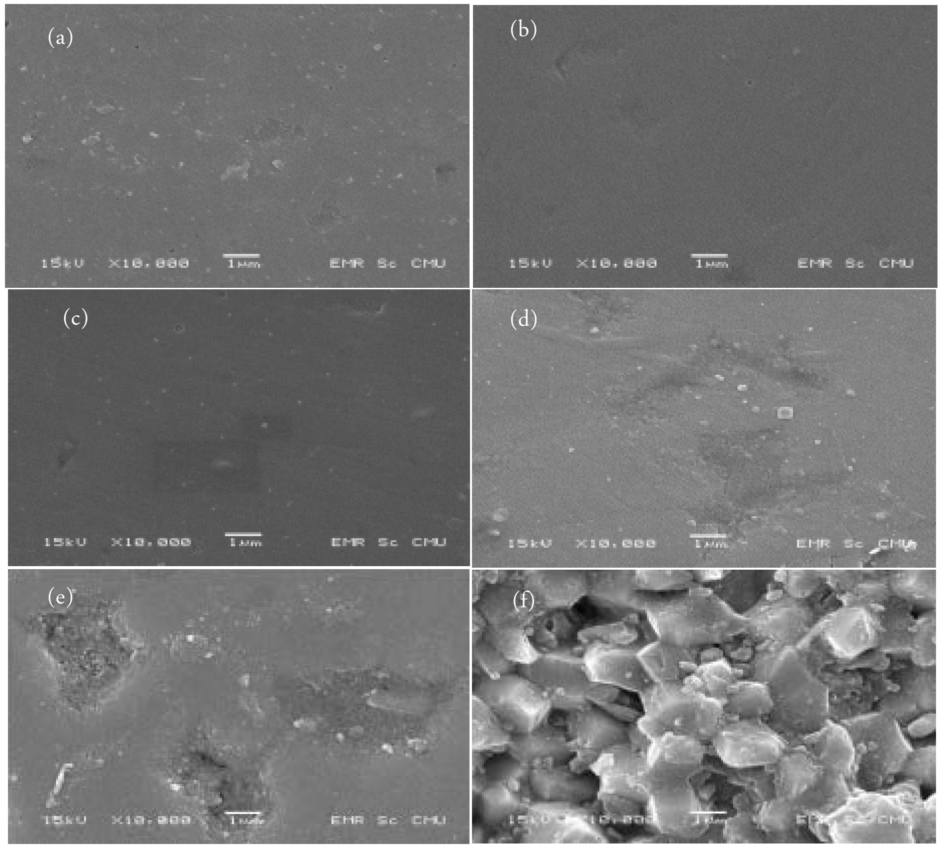

Fig. 3. . SEM of HA compact at various sintering temperature (a) 1,000 °C (b) 1,050 °C (c) 1,100 °C (d) 1,150 °C (e) 1,200 °C and (f) cross-section view of HA compact at 1,050 °C

Fig. 2 shows the images of HA compact scaffold taking from OM. These images reveal surface topography of the specimens at different sintering temperatures. According to these microstructures, it shows that when the sintering temperatures increased, the porosity percentage on the specimen's surface was significantly increased. It can be suggested that the increase in porosity was a result of grain coarsening effect.

When using SEM to explore the topography of these surfaces (as shown in Fig. 3 a-e), it could be seen clearly that the pores on the surface of the sintered specimens were hardly observed in small selective area of specimen at lower sintering temperature. The pore size appeared to be larger as the sintering temperature was increased. Fig. 4 (f) shows the cross section of center compact. It was clearly seen that the morphology at the center was different from the surface. It can be concluded that the grain coarsening was not active at the center of the compact due to a rapid heating.

Fig. 4 illustrates the result from the density test, which showed that the density of the compact scaffold was decreased when the sintering temperature increased. These results showed quite similar behavior as the previous study by Que et al. (2008) [8]. Compared to the previous study, the difference in density at the sintering temperature 1050°C or more could be attributed to grain coarsening at the surface and remaining of porosity at the center of the scaffold.

The hardness of the HA sintered compact scaffolds was illustrated in Fig. 5. As can be seen from this graph, the hardness of HA compacted was fairly consistent when the sintering temperature below 1100°C and significantly decreased at higher temperature. The hardness trend was found to be different with the previous study. The main reason could be the porosity observed at the high sintering temperature.

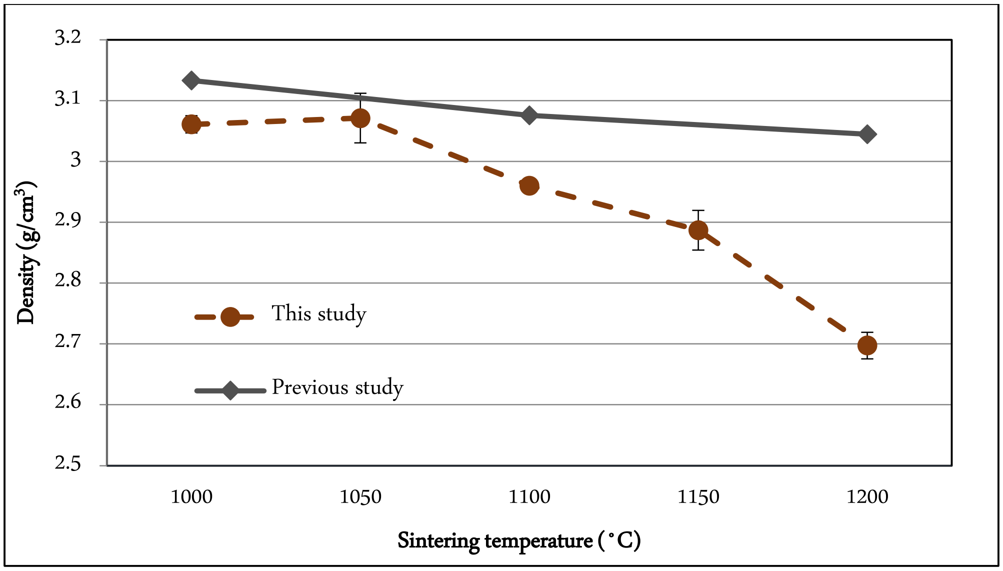

Fig. 4. Comparative Study of Density

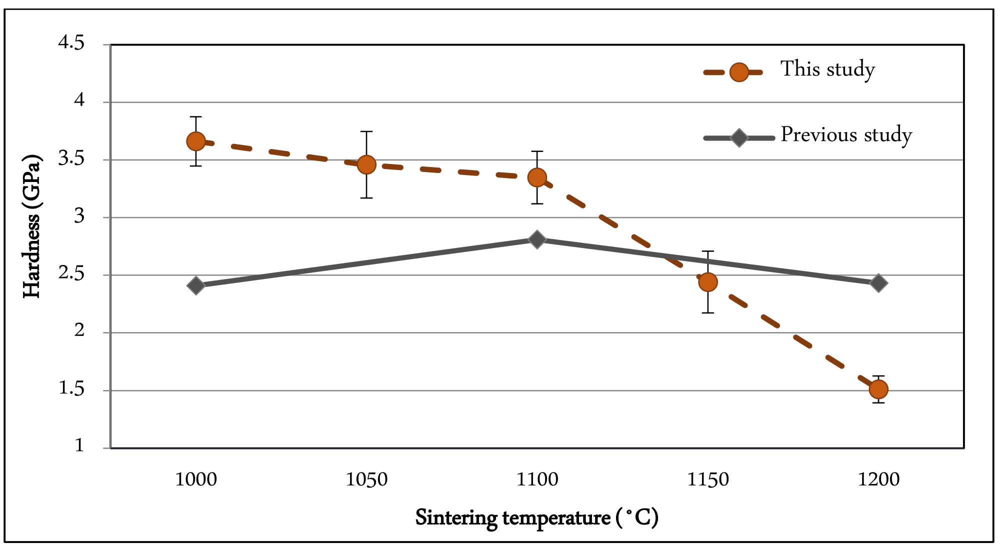

Fig. 5. Comparative Study of Hardness

IV. Conclusion

HA was successfully synthesized using natural based material as a precursor, and it was possible to fabricate HA compact scaffold by using the SPS technique. According to the results, when increasing the sintering temperature, both density and hardness of the compact scaffold were decreased. Possible cause of this reduction could be the formation of pores, which could lessen the density and the hardness of the sintered specimen. With respect to the current investigation, the best characteristics of compact scaffold were 3.66 GPa of hardness at 1,000 ˚C and 3.07 g/cm3 of density at 1,050 ˚C, which were moderately different from the previous study [8], which were 2.81 GPa of hardness at 1,100 ˚C and 3.133 g/cm3 of density at 1,000 ˚C. Future study will focused on other scaffold characteristics such as biocompatibility and osteoconductivity, in order to investigate the potential of product implementation for medical application.

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