Effect of Silica Compositions on Phase Transformation and Compressive Strength of Sintered Perlis Dolomite

Nur Hasnidah Ahmad Shukeri1\*, Syed Nuzul Fadzli Syed Adam1\*, Hasmaliza Mohamad2 and Heah Cheng Yong1

1 Faculty of Mechanical Engineering and Technology, Universiti Malaysia Perlis (UniMAP) 02600, Ulu Pauh, Perlis Malaysia

2 School of Materials and Mineral Resources Engineering, Universiti Sains Malaysia (USM) 14300, Transkrian Penang, Malaysia

Nur Hasnidah\* ([hasnidahnur@gmail.com](mailto:hasnidahnur@gmail.com))

Syed Nuzul Fadzli (syed.nuzul@unimap.edu.my)

Hasmaliza Mohamad (hasmaliza@usm.my)

Heah Cheng Yong (cyheah@unimap.edu.my)

**Abstract.** Natural dolomite sedimentary rocks, which can be found in abundance in Perlis is a carbonate mineral rich with calcium and magnesium elements. These both elements were important and typically found in bioceramic materials especially for hard tissue implant material. Even though raw Perlis dolomite powder has other various elemental compositions, it lacks important component such as silica which commonly acts as glass network former, in resulting limits its potential application as bioceramic materials. This study investigates the effects of different compositions of silica addition on sintered Perlis dolomite and the changes in its phase transformation, structure and compressive strength were analyzed. Perlis dolomite with different ratios of silica (30, 35 and 40 wt. %) were ball milled, compacted into pallets and sintered at 1300°C for 4 hours. The results show that the silica contents gave a significant impact on the phase transformation of the resulting materials involving akermanite, monticellite and merwinite. At lower silica content (30S), monticellite and merwinite become the dominant phase with slight amount of akermanite. But increasing the silica content leads to the formation of akermanite phase, while reduces the monticellite and merwinite phase before merwinite phase completely disappearing at 40S. Higher silica content in dolomite enhances phase stability by increasing akermanite phase in the sintered samples with improvement in compressive strength (14-18 MPa), which promising for bone tissue regenerations.

**Keywords:** Perlis Dolomite, Silica, Akermanite, Monticellite, Merwinite