

**Title :** Effects of Heating Rates and Sintering Temperatures on Physical and Microstructure of Porcelain

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## ABSTRACT

The objective of this research was to study the physical properties and microstructural characteristics of porcelain by investigating the effects of heating rates and sintering temperatures. Heating rate and sintering temperature have significant effects on the properties of porcelain. Faster heating rates can lead to higher strength in some materials due to lower porosity and specific crystal formation. On the other hand, it may cause uneven heating, potentially leading to cracking or warping, especially in thicker pieces. In this experiment, the sintering temperature and soaking time of porcelain body were studied. Firstly, the specimens were prepared by pressing method in the disc shape and then fired at three different temperatures: 1200, 1250, and 1300°C, with a heating rate of 10°C per minute. From the experiment results, it was found that the higher temperature increased the density and diametral compressive strength of the specimens. Secondly, the increase of soaking time from 30 minute to 4 hour also gave the higher density

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and diametral compressive strength of fired specimens. Moreover, the mineralogical properties and microstructure of specimens were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM) techniques. The results showed that the unfired specimens contain kaolinite, feldspar and quartz phases. The specimens which fired at temperatures between 1200–1300°C could lead to the formation of mullite crystals. Moreover, prolonged soaking times might result in the growth of primary and secondary mullite phases.

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