

## **ABSTRACT**

*Dental composite resin is one of the common methods of treating cavities due to its biocompatibility. Dental composite resin consists of a matrix of polymer resin and filler. A widely used type of inorganic filler is  $\beta$ -tricalcium phosphate ( $\beta$ -TCP,  $\beta$ -Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>). Beta-tricalcium phosphate is one of the most researched types of calcium phosphate because it can facilitate remineralization to dental cells. The polymerization reaction of dental resin composite is activated using blue light ( $\lambda = 468\text{nm}$ ) through curing. The length of curing time needs to be set appropriately to ensure the dental resin composite reaches optimum strength. This study examined the effect of adding  $\beta$ -TCP as a filler on the properties of commercial dental composite resins with a variation of curing time of 5-25 seconds. Beta-tricalcium phosphate was synthesized using the sol-gel method with calcination at 800°C to produce white powder. The synthesized product characterized using FTIR shows the character of  $\beta$ -TCP at PO<sub>4</sub><sup>3-</sup> vibrations located at wave numbers 563cm<sup>-1</sup>, 601cm<sup>-1</sup>, 1040cm<sup>-1</sup>. The synthesized product in the form of  $\beta$ -TCP was confirmed through a diffractogram in accordance with JCPDS No. 09-169 with crystal planes (0 2 10), (2 2 0), and (2 1 4). The  $\beta$ -TCP product has a crystal grain size of 122.129Å, crystallinity of 87.05%, average particle size of 715.6 nm, polydispersity index (PI) of 0.6075, and zeta potential of -25.25 mV. The addition of  $\beta$ -TCP did not change the original character of the commercial composites. Composites with longer curing time (20-25 s) showed an increasing trend in yield strength and toughness values. The surface of the  $\beta$ -TCP/Resin composite is an irregular-shaped aggregate confirmed to be  $\beta$ -TCP and glass powder on the outside and polymer on the inside.*

**Keywords:** dental composite resin,  $\beta$ -TCP, curing time, composite character, polymerization reaction