

ABSTRACT

Cavities are the most common problem caused by microorganisms. Efforts to repair the damage need to be done by filling using composite resin. Composite resin consists of a matrix and filler, the commonly used matrix is UDMA and TEGDMA, and the commonly used filler is glass powder. Beta-tricalcium phosphate (β -TCP) has biocompatible properties and can remineralize damaged teeth. Beta-tricalcium phosphate (β -TCP) has an unstable structure, so one of its components needs to be substituted with cerium (Ce). β -TCP can enhance bioactivity, which promotes the growth of new cells. This study aims to synthesize β -TCP and β -TCP_Ce using the sol-gel method and to examine the mechanical, chemical, and surface morphological properties of the resin/ β -TCP composite. This study aims to synthesize β -TCP and β -TCP_Ce using the sol-gel method and to investigate the mechanical, chemical, and surface morphological properties of resin/ β -TCP and resin/ β -TCP_Ce composites after being immersed in RL solution for 1–5 days. The precursors used were Ca, Ce, and P with a Ca/P ratio and (Ca+Ce)/P ratio of 1.2, fired at 80°C for 30 minutes. The synthesis results were characterized using FTIR, XRD, and PSA. The resin composites were immersed in RL solution for 1–5 days and characterized using FTIR, UTM, and FESEM-EDX. The characterization of β -TCP and β -TCP_Ce was successfully performed, with the structure of β -TCP_Ce similar to β -TCP, the crystal particle size of β -TCP being 12.21 nm, the particle size being 0.71 μ m, and the zeta potential value being -25.25 mV. The crystal grain size of β -TCP_Ce was 11.12 nm, particle size was 0.18 μ m, and zeta potential was -18.61 mV. After soaking in RL solution, no significant changes in functional groups were observed. The resin/ β -TCP_Ce composite sample was more stable than the resin/ β -TCP composite, as evidenced by the decrease in the toughness area and yield strength of the composite after immersion in RL solution. The FESEM-EDX results of the resin/ β -TCP_Ce sample after immersion in RL solution for 5 days confirmed the distribution of Ca and Ce elements from β -TCP_Ce on the composite surface.

Keywords : β -TCP and β -TCP_Ce, Dental Composite Resin, Polymerization Reaction, Ringer's Lactate, Composite Characteristics