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Improving coral sand based hydroxylapatite bone graft's strength with brown algae

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Hydroxylapatites are among the most useful bioceramic, for multiple application in bone defects, including the follow-up treatment of osteosarcoma. There are studies, about what hydoxylapatite are made of, including the use of coral as known as Coralline HA. Coral is used as hydroxylapatite because of its porous structure, biodegradability and biocompatibility despite of its status as protected sea plant. In this work, we synthesized and characterized coral sand based $Ca_{10}(PO_4)OH_2$ with $(NH_4)_2HPO_4$ to maximize the potential of coral without damaging the sea ecosystem using hydrothermal method with temperature variation of 120°C, 140°C and 160°C. Result of the hydrothermal method with various temperature shows that the sample with highest amount of hydroxylapatite (80.3%) is 120°C by X-Ray Diffractometer. The resulting $Ca_{10}(PO_4)OH_2$ from previous result was then synthesized with various concentration of brown algae based Natrium Alginate: 2% w/t; 4% w/t and 6% w/t to improve the compressive strength knowing that coral based hydroxylapatite is highly porous and brittle. Autograph was used to test out the compressive strength of the samples. Scanning Electron Microscope (SEM) was also used to examine the morphology of samples' surface to observe the pore size of samples. The result shows that $Ca_{10}(PO_4)OH_2$ with highest concentration of Natrium Alginate had the most compressive strength and the smallest pore size which is 5.73-5.76 MPa and ±48 μm respectively. Lower concentration of Natrium Alginate shows decreased compressive strength and increased pore size. This could conclude that hydrothermal method improves the purity of hydroxylapatite and Natrium Alginate enhances hydroxylapatite's mechanical properties.

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