Karakterisasi fisika-kimia dari perancah berbahan dasar karbon/hidroksiapatit/fibrin untuk mempercepat regenerasi tulang = Physical-chemical characterization of carbon/hydroxyapatite/fibrin-based scaffolds to accelerate bone regeneration

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Abstrak

Fraktur tulang merupakan kondisi kerusakan pada sebagian atau seluruh kontinuitas tulang yang dapat menyebabkan beberapa komplikasi seperti infeksi, pendarahan, kerusakan pada saraf dan pembuluh darah, dan defek. graphine oxide/hidroksiapatit/fibrin, functionalized graphite/hidroksiapatit/fibrin, functionalized multiwalled carbon nanotubes/hidroksiapatit/fibrin, dan hidroksiapatit/fibrin perancah HAp/F memiliki ukuran pori 0,5 – 4,1 m, GO/HAp/F 2,6 – 6,1 m, fG/HAp/F 0,7 – 14,1 m dan fMWCNT/HAp/F 1,5 – 11,1 m. Terdapat gugus PO43- , O-H, C-H, C-O alifatik, dan amida I pada setiap kelompok perancah. Dengan penambahan gugus fungsi C=O pada perancah dengan penambahan material karbon. Nilai kekuatan tekan pada perancah GO/HAp/F, fG/HAp/F, dan fMWCNT/HAp/F sesuai dengan kekuatan tekan cancellous bone. Persentase porositas paling besar padaperancah GO/HAp/F sebesar 9,99 ± 2,85%. Perancah GO/HAp/F memiliki persentase swelling yang paling tinggi dan laju degradasi yang paling lambat. Sedangkan retensi yang paling baik ditunjukkan oleh perancah fG/HAp/F dengan persentase 8,27%. Berdasarkan keseluruhan hasil, perancah HAp/F dengan penambahan material GO mempunyai karakteristik fisika-kimia yang lebih baik pada penelitian ini dibandingkan dengan perancah fMWCNT atau fG.

.....A fracture is a condition when the continuity of the bone is broken causing several complications such as infection, bleeding, damage to nerves and blood vessels, and disability. In this research, the solution offered is to fabricate a scaffold with a combination of biomaterials or composites in the form of graphine oxide/hydroxyapatite/fibrin, functionalized graphite/hydroxyapatite/fibrin, functionalized multiwalled carbon nanotubes/hydroxyapatite/fibrin, and hydroxyapatite/fibrin. Scaffolds were synthesized using the freeze-drying method. This study aims to determine the physico-chemical characteristics of the four groups of scaffolds. Based on the results of SEM-EDS, the HAp/F scaffold has a pore size of 0.5 – 4.1 m, GO/HAp/F has 2.6 – 6.1 m, fG/HAp/F has 0.7 – 14.1 m and fMWCNT/HAp/F has 1.5 – 11.1 m. There were PO43- , O-H, C-H, aliphatic C-O and amide I groups in each scaffold. Additionally the C=O functional group on the scaffold with the addition of carbon material. The compressive strength values of GO/HAp/F, fG/HAp/F, and fMWCNT/HAp/F scaffolds correspond to the compressive strength of the cancellous bone. The highest percentage of porosity is GO/HAp/F scaffolds with 9.99 ± 2.85%. GO/HAp/F scaffolds had the highest swelling percentage and the slowest degradation rate. Meanwhile, the best retention was shown by fG/HAp/F scaffold with a percentage of 8.27%. Based on the overall results, the HAp/F scaffold with the addition of GO material had better physico-chemical characteristics in this study than fMWCNT or fG scaffolds.