Pengaruh temperatur pendinginan pada proses thermally induced phase separation dalam fabrikasi biomaterial penyangga tulang berbahan dasar hidroksiapatit/kitosan = Effect of freezing temperature in thermally induced phase separation method for bone scaffold biomaterial based on hydroxyapatite/chitosan

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Abstrak

Dalam penelitian ini, scaffold berbahan dasar hidroksiapatit (HA) dan kitosan telah berhasil difabrikasi dengan menggunakan metode thermally induced phase separation (TIPS) yang dilakukan dengan variabel temperatur pendinginan -20, -30, -40 dan -80 derajat Celcius. Sebelumnya, sampel dicampurkan secara homogen dengan perbandingan fraksi berat 70% HA dan 30% kitosan dilarutkan dengan asam asetat 2% yang selanjutnya dikarakterisasi dengan pengujian FTIR, uji kekuatan kompresi dan pengamatan morfologi dengan Scanning Electron Microscope (SEM).
Hasil penelitian menunjukkan bahwa semakin rendah temperatur pendinginan maka ukuran porositas semakin kecil. Dengan temperatur pendinginan -20oC diperoleh ukuran pori sebesar 133,93 µm dan memiliki kekuatan kompresi sebesar 5,9 KPa sedangkan untuk ukuran pori 60,55 µm pada pendinginan -80oC diperoleh kekuatan kompresi sebesar 29,8 KPa. Ditinjau dari segi ukuran pori, scaffold berbahan dasar HA/kitosan mempunyai potensi untuk diaplikasikan sebagai penyangga tulang pada manusia.
<hr>In the current study, hydroxyapatite (HA)/chitosan-based bone scaffold has been fabricated by using thermally induced phase separation (TIPS) method under freezing temperature variation of -20, -30, -40 and -80 oC. The samples with weight percent ratio of 70% HA and 30% chitosan were homogeneously mixed and were subsequently dissolved in 2% acetic acid. The synthesized samples were further characterized by using Fourier transform infrared (FTIR), compressive test and scanning electron microscope (SEM).
The investigation results showed that low freezing temperature reduced the pore size and increased the compressive strength of the scaffold. In the freezing temperature of -20oC, the obtained pore size was 133.93 µm with the compressive strength of 5.9 KPa, while for -80oC, the obtained pore size was decreased down to 60.55 µm with the compressive strength of 29.8 KPa. Considering the obtained characteristics, HA/chitosan obtained in this work has the potential to be applied as a bone scaffold.