

# Karakterisasi fasa kristal hidroksiapatit dan ukuran pori scaffold hidroksiapatit-gelatin-propolis sebagai biomaterial bone tissue engineering = Characterization of hydroxyapatite crystalline phase and scaffold pore size of hydroxyapatite-gelatin-propolis as bone tissue engineering biomaterial

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## Abstrak

Latar Belakang: Bone tissue engineering merupakan alternatif untuk remodeling tulang pada defek kritis melalui pemanfaatan scaffold tiga dimensi berbahan polimer maupun ceramic. Bahan dari alam seperti propolis telah terbukti mampu meningkatkan pembentukan tulang baru melalui pemanfaatannya secara tunggal maupun dengan material lainnya. Namun, penambahan propolis dengan polymer-ceramic based scaffold belum pernah dilakukan sebelumnya. Tujuan: Mengevaluasi pengaruh propolis terhadap fasa kristal hidroksiapatit dan ukuran pori scaffold hidroksiapatit-gelatin-propolis melalui karakterisasi XRD dan SEM. Metode: Karakterisasi XRD dan SEM dilakukan pada scaffold dengan prosedur yang diadaptasi dari penelitian Sunarso et al. (2011). Agen crosslink pada penelitian ini menggunakan glutaraldehida. Scaffold dikarakterisasi dengan XRD untuk mengamati fasa kristal hidroksiapatit dan SEM untuk mengamati morfologi permukaan. Hasil: Pada seluruh spesimen, fasa kristal masih didominasi oleh  $\text{Ca}(\text{OH})_2$  dan kadungan hidroksiapatit menurun seiring penambahan propolis. Semakin tinggi konsentrasi propolis, ukuran pori semakin meningkat dengan rentang rata-rata diameter pori dari seluruh spesimen 87 m-112 m. Kesimpulan: Hidroksiapatit pada penelitian ini tidak terbentuk sempurna dan penambahan propolis menurunkan kristalinitas hidroksiapatit. Secara morfologi, spesimen yang dihasilkan memenuhi syarat scaffold.

.....Background: Bone tissue engineering is an alternative for bone remodeling in critical defects through the use of three-dimensional scaffold made from polymer or ceramic. Natural material such as propolis has been shown to increase new bone formation through their use alone or with other materials. However, incorporation of propolis to polymer-ceramic based scaffold has never been done before. Objective: To evaluate the effect of propolis on hydroxyapatite crystal phase and pore size of hydroxyapatite-gelatin-propolis scaffold through XRD and SEM characterization. Methods: XRD and SEM characterization was carried out on scaffold made from chemical mixing procedure adopted from Sunarso et al. (2011). This study used glutaraldehyde as crosslink agent. The scaffold was characterized by XRD to observe the hydroxyapatite crystal phase and SEM to observe the surface morphology. Results: The crystal phase from all specimens is still dominated by  $\text{Ca}(\text{OH})_2$  and the hydroxyapatite content is decreasing as the addition of propolis. Addition of propolis also increasing the pore size increases with the average range is 87 m-112 m. Conclusion: The hydroxyapatite in this study is not fully formed and the addition of propolis decreases the crystallinity of hydroxyapatite. Morphologically, all specimens fulfill the scaffold requirements.