

# Pengaruh Substitusi Tembaga Terhadap Struktur Fisik dan Morfologi dari Hidroksiapatit yang melapisi SS 316L menggunakan Metode Sol-gel Dip coating = The Effect of Copper Substitution on the Physical Structure and Morphology of Hydroxyapatite Coated On SS 316L Using the Sol-Gel Dip Coating Method

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## Abstrak

Hidroksiapatit merupakan biomaterial keramik yang dapat digunakan sebagai pelapis dari implan logam karena dapat memberikan sifat bioaktif dan biodegradable yang baik pada implan. Penambahan sifat implan sendiri dapat ditingkatkan salah satunya adalah penambahan sifat anti-bakteri E.Coli dan S.Albicans ketika tembaga (Cu) disubstitusikan kedalam hidroksiapatit (HA). Pada penelitian ini tembaga-hidroksiapatit (Cu-HA) akan dilapisi ke logam SS 316L dengan metode sol gel dip coating dan diuji berdasarkan tingkat konsentrasi 0%, 5%, dan 7% Cu-HA tembaga untuk mempelajari pengaruhnya terhadap gugus fungsi, struktur kristal dan morfologi dari permukaan lapisan Cu-HA. Pengujian karakterisasi dilakukan menggunakan Fourier transform infrared (FTIR), X-ray diffraction (XRD), dan juga Scanning Electron microscope (SEM-EDS). Dari hasil pengujian XRD didapatkan bahwa ukuran kristal 0%, 5%, dan 7% Cu-HA Cu-HA secara berurut sebesar 17,819, 17,296 dan 17,205. Derajat kristalinitas 0%, 5%, dan 7% Cu-HA Cu-HA secara berurut sebesar 12,93%, 11,47% dan 11,14%. Hasil tersebut menunjukkan ion Cu menurunkan besar kristal, derajat kristal, dan juga kisi kristal. Gugus fungsi FTIR pada Cu-HA tetap memiliki karakteristik dari HA namun juga menunjukkan ciri ikatan Cu-O pada bilangan gelombang tertentu. Pengujian SEM menunjukkan besar porositas dari lapisan 0%, 5%, dan 7% Cu-HA Cu-HA sebesar 5,57%, 16,32%, dan 16,32%. Serta didapatkan konsentrasi Ca+Cu/P secara berurut sebesar 1,78, 1,83, dan 1,73. Dari hasil tersebut didapatkan bahwa penambahan Cu menyebabkan persentase porositas mengalami perbesaran.

.....Hydroxyapatite is a ceramic biomaterial that can be used as a coating for metal implants because it can provide good bioactive and biodegradable properties to the implant. The addition of implant properties can be improved, one of which is the addition of anti-bacterial properties of E.Coli and S.Albicans when copper (Cu) is substituted into hydroxyapatite (HA). In this research, copper-hydroxyapatite (Cu-HA) will be coated onto SS 316L metal by sol gel dip coating method and tested based on the concentration level of 0%, 5%, and 7% Cu-HA copper to study its effect on functional groups, crystal structure and morphology of the Cu-HA coating surface. Characterization testing done using Fourier transform infrared (FTIR), X-ray diffraction (XRD), and also Scanning Electron microscope (SEM-EDS). From the XRD test results, it was found that the crystal sizes of 0%, 5%, dan 7% Cu-HA Cu-HA were 17,819, 17,296 and 17,205, respectively. The degree of crystallinity of 0%, 5%, dan 7% Cu-HA Cu-HA is 12,93%, 11,47% and 11,14% respectively. From these results it can be concluded that the substitution of Cu ions decreases the crystal size, crystal degree, and also crystal lattice. The FTIR functional groups on Cu-HA still have the characteristics of HA at the peak points, indicating that this substitution can be done and does not damage the groups of HA. SEM testing showed that the porosity of the 0%, 5%, dan 7% Cu-HA Cu-HA layer was found to be 5,57%, 16,32%, and 16,32%. The Ca+Cu/P concentration was found to be 1,78, 1,83, and 1,73,

respectively. Which means the increased ions of Cu increase the percentage of porosity too.