

## ABSTRACT

### **Stainless Steel 316 L Metal Coating with Organic Hydroxyapatite Using Electrophoretic Deposition Method as Bone Implant Candidate**

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Organic hydroxyapatite (HAp) based on capiz shell has been successfully coated onto stainless steel 316L substrate using electrophoretic deposition (EPD) method. In this study, three variations were applied, they were the voltages of 25 V and 50 V, withdrawal speeds of 0,1 mm/s, 0,5 mm/s, and 1 mm/s, and the sintering temperatures of 750° C, 850° C, and 950° C. These variations were applied to determine the differences in morphology, thickness, and crystal structure of the layers so that the most suitable result was obtained as a candidate for bone implant. Characterization was done by Scanning Electron Microscopy and X-Ray Diffractometer.

The EPD process and the application of sintering temperature eliminated the phase of B type apatite carbonate which made the purity of the HAp layer higher. The SEM results show that the layer was more homogeneous, thicker, and free of cracking at a voltage of 50 V and the withdrawal speed is 0.1 mm/s. The layer density was higher as the voltage and sintering temperature increased. Higher sintering temperature also made the layer more homogeneous, but at 950° C, stainless steel 316L substrate underwent a phase transformation which caused the decreasing of the purity of HAp layer. The best results were obtained by applying a 50 V voltage, a withdrawal speed of 0.1 mm/s, and sintering temperature of 850° C.

**Key Words:** coating, hydroxyapatite, stainless steel 316L, electrophoretic deposition

## INTISARI

### **Pelapisan Logam *Stainless Steel* 316L dengan Hidroksiapatit Organik Menggunakan Metode *Electrophoretic Deposition* sebagai Kandidat Implan Tulang**

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Hidroksiapatit (HAp) organik berbahan dasar cangkang kerang simping telah berhasil dilapiskan ke substrat *stainless steel* 316L menggunakan metode *electrophoretic deposition* (EPD). Dalam penelitian ini diterapkan tiga variasi yakni tegangan 25 V dan 50 V, kecepatan penarikan 0,1 mm/s, 0,5 mm/s, dan 1 mm/s, serta suhu sintering 750° C, 850° C, dan 950° C. Variasi yang diterapkan bertujuan untuk mengetahui perbedaan morfologi, ketebalan, serta struktur kristal lapisan sehingga diperoleh hasil yang paling sesuai sebagai kandidat implan tulang. Karakterisasi dilakukan dengan *Scanning Electron Microscopy* dan *X-Ray Diffractometer*.

Proses EPD dan penerapan suhu sintering menghilangkan fase apatit karbonat tipe B yang membuat kemurnian lapisan HAp menjadi lebih tinggi. Hasil SEM menunjukkan bahwa lapisan lebih homogen, lebih tebal, dan bebas *cracking* pada tegangan 50 V dan kecepatan penarikan 0,1 mm/s. Densitas lapisan lebih tinggi seiring dengan peningkatan tegangan dan suhu sintering. Suhu sintering yang lebih tinggi juga membuat lapisan lebih homogen, namun pada suhu 950° C substrat *stainless steel* 316L mengalami transformasi fasa yang menyebabkan kemurnian lapisan HAp berkurang. Hasil terbaik diperoleh dengan penerapan tegangan 50 V, kecepatan penarikan 0,1 mm/s, dan suhu sintering 850° C.

**Kata Kunci:** pelapisan, hidroksiapatit, *stainless steel* 316L, *electrophoretic deposition*