PENGARUH BESAR *VOLTAGE* PADA PROSES *ANODIZING* TERHADAP LAJU DEGRADASI KOMPOSIT *BIODEGRADABLE* Mg-xCAp R4

SKRIPSI

Diajukan untuk memenuhi salah satu dari syarat untuk memperoleh Gelar Sarjana Sains Program Studi Fisika Kelompok Bidang Kajian Fisika Material

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Dengan ini saya menyatakan bahwa skripsi dengan judul **"PENGARUH BESAR *VOLTAGE* PADA PROSES *ANODIZING* TERHADAP LAJU DEGRADASI KOMPOSIT *BIODEGRADABLE* Mg-xCAp R4"** ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutupan dengan cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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ABSTRAK

Implan *biodegradable* merupakan salah satu inovasi yang dapat menggantikan peran implan bio-inert dalam aplikasi implant non-permanen untuk luka tulang traumatik karena penggunaannya dianggap lebih efisien dari segi proses penyembuhan dan biayanya. Salah satu material *biodegradable* yang berpotensial untuk dimanfaatkan sebagai bahan dasar implant non-permanen adalah magnesium karena merupakan jenis biometal yang karakteristik mekaniknya hampir sebanding dengan tulang. Namun, laju degradasi magnesium yang tinggi menjadi salah satu halangan dalam proses realisasi pengaplikasian magnesium sebagai bahan dasar implant tulang. Berbagai cara, seperti pembentukan magnesium alloy, struktur komposit berbasis magnesium (salah satunya adalah Mg-CAp), dan *surface treatment* telah dilakukan untuk mengatasi permasalahan tersebut. Metode *anodizing* adalah salah satu metode *surface treatment* yang juga dapat dipilih sebagai langkah lebih lanjut untuk meningkatkan kualitas laju degradasi implan berbasis magnesium. Penelitian ini berfokus kepada pengaruh pemberian tegangan terhadap laju degradasi serta ketebalan dan unsur lapisan anodik yang terbentuk pada permukaan komposit Mg-xCAp (x = 0, 5, 10, dan 15 wt%). Proses *anodizing* dilakukan selama 15 menit dengan tiga variasi tegangan berbeda (10, 15, dan 20 V). Laju degradasi sampel diperoleh melalui proses pengujian korosi elektrokimia (OCP, EIS, dan Tafel), sedangkan ketebalan dan unsur lapisan anodik diamati melalui uji SEM-EDX-Mapping. Hasil penelitian menunjukkan bahwa peningkatan tegangan *anodizing* dapat meningatkan ketahanan korosi serta ketebalan dan konsentrasi unsur oksigen yang terkandung pada lapisan anodik. Akan tetapi, peningkatan besar tegangan ternyata juga dapat menimbulkan retakan pada lapisan anodik.

Kata Kunci: Implan Tulang; Komposit Mg-CAp; Korosi; Anodisasi; Lapisan Film Anodik Oksida.

ABSTRACT

Biodegradable implants are one of many innovations that can be utilized as a promising alternative to bio-inert implants in developing temporary implants for bone injury treatment because their application is considered more effective in terms of the healing process and cost. Magnesium, as a biodegradable metal, holds significant potential as a base material for temporary implants due to its mechanical properties, which closely resemble those of bone. However, the high degradation rate of magnesium has become one drawback to its application. Several approaches, including the development of magnesium alloys, magnesium-based composites (such as Mg-CAp), and various surface treatments (such as anodizing), can be employed to mitigate its drawbacks. This research focuses on observing the influence of voltage used in anodizing treatment on the degradation rate of anodized Mg-CAp, thickness, and elements of the anodic oxide film formed on the surface of Mg-xCAp (x = 0, 5, 10, and 15 wt%). The anodizing process was carried out for 15 minutes with three different voltage variations (10, 15, and 20 V). The sample's degradation rate was determined using electrochemical corrosion tests (OCP, EIS, and Tafel), while the thickness and elemental composition of the anodic film were analyzed using SEM-EDX-mapping. The results show that increasing the anodizing voltage can improve corrosion resistance and the thickness and concentration of oxygen elements in the anodic film. However, it has also been found that increasing the voltage can give rise to the formation of cracks in the anodic film.

Keyword: Bone Implants; Mg-xCAp composite; Corrosion; Anodization; Anodic Oxide Film.

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