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Investigation of coatings , corrosion and wear characteristics of machined biomaterials through hydroxyapatite mixed - edm process : A review

Al-Amin M.^a✉, Abdul-Rani A.M.^a✉, Danish M.^b✉, Rubaiee S.^b✉, Mahfouz A.B.^d✉, Thompson H.M.^e✉, Ali S.^f✉, Unune D.R.^g✉, Sulaiman M.H.^h✉[📧 Save all to author list](#)^a Department of Mechanical Engineering, Universiti Teknologi Petronas, Seri Iskandar, 32610, Malaysia^b Department of Mechanical and Materials Engineering, University of Jeddah, Jeddah, 21589, Saudi Arabia^c Department of Industrial and Systems Engineering, University of Jeddah, Jeddah, 21589, Saudi Arabia^d Chemical Engineering Department, University of Jeddah, Jeddah, 21589, Saudi Arabia[View additional affiliations](#) ▾

Abstract

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Abstract

Together, 316L steel, magnesium-alloy, Ni-Ti, titanium-alloy, and cobalt-alloy are commonly employed biomaterials for biomedical applications due to their excellent mechanical characteristics and resistance to corrosion, even though at times they can be incompatible with the body. This is attributed to their poor biofunction, whereby they tend to release contaminants from their attenuated surfaces. Coating of the surface is therefore required to mitigate the release of contaminants. The coating of biomaterials can be achieved through either physical or chemical deposition techniques. However, a newly developed manufacturing process, known as powder mixed-electro discharge machining (PM- EDM), is enabling these biomaterials to be concurrently machined and coated. Thermoelectrical processes allow the migration and removal of the materials from the machined surface caused by melting and chemical reactions during the machining. Hydroxyapatite powder (HAp), yielding Ca, P, and O, is widely used to form biocompatible coatings. The HAp added- EDM process has been reported to significantly improve the coating properties, corrosion, and wear resistance, and biofunctions of biomaterials. This article extensively explores the current development of bio-coatings and the wear and corrosion characteristics of biomaterials through the HAp mixed- EDM process, including the importance of these for biomaterial performance. This review presents a comparative analysis of machined surface properties using the existing deposition methods and the EDM technique employing HAp. The dominance of the process factors over the performance is discussed thoroughly. This study also discusses challenges and areas for future research. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Author keywords

Biomaterials ; Coatings ; Corrosion ; Electro-discharge ; Hydroxyapatite ; Wear

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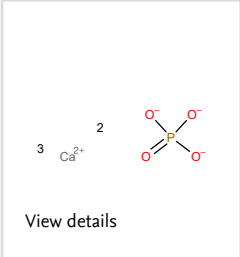
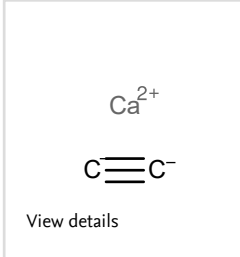
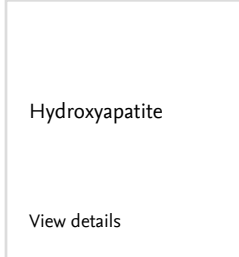
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Biocompatible coatings; Biomedical applications; Comparative analysis; Corrosion characteristics; Electro discharge machining; Hydroxyapatite powder; Manufacturing process; Mechanical characteristics

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🔍 Al-Amin, M.; Department of Mechanical Engineering, Universiti Teknologi Petronas, Seri Iskandar, Malaysia; email:alamin0903091me@gmail.com

🔍 Abdul-Rani, A.M.; Department of Mechanical Engineering, Universiti Teknologi Petronas, Seri Iskandar, Malaysia; email:majdi@utp.edu.my

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