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Porous thin film formed by electrochemical method to improve the corrosion and tribocorrosion performances of Ti-10 Zr alloy in biological solution

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Several surface engineering methods have been explored to enhance the corrosion and wear resistance or tribocorrosion of the titanium and its alloys while maintaining their biocompatibility. Among these methods, the production of oxide films by anodic oxidation treatment offers some promising features. In this research work the electrochemical methods were applied to form a thin porous mixed oxide film (TiO2-ZrO2) on Ti-10 Zr alloy surface. Comparative investigation of untreated Ti-10 Zr alloy surface and porous anodic oxide film growth on Ti-10Zr was carried out to determine the tribocorrosion performances in biological solution were performed. The in situ electrochemical technique is used for investigation of tribo electrochemical degradation and the open circuit potential (OCP) measurement was performed before, during and after sliding tests. The results show that controlled anodic oxidation techniques applied to titanium alloy can significantly enhance the tribo-electrochemical performances of Ti–10 Zr alloy surface for biomedical applications. The tribocorrosion process has applications in orthopedic and dentistry fields, since it is known that the implants are often exposed to simultaneous chemical/electrochemical and mechanical stresses. The formed porous oxide film was tested in biolological solution without and under different imposed loads (tribocorrosion system) and the results were compared with that of the untreated alloy surface.

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