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Synthesis of a novel nanostructured zinc oxide/baghdadite coating on Mg alloy for biomedical application: *In-vitro* degradation behavior and antibacterial activities

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Abstract

In this research, zinc oxide (ZnO) and zinc oxide/baghdadite (ZnO/Ca₃ZrSi₂O₉) were prepared on the surface of Mg alloy using physical vapor deposition (PVD) coupled with electrophoretic deposition (EPD). For this purpose, the nanostructured ZnO was prepared with a thickness of 900 nm and crystallite sizes of 64 nm as under layer while nanostructured baghdadite with a thickness of 10 μm was deposited on the Mg alloy substrate as an over-layer. Electrochemical measurement exhibited that the ZnO/Ca₃ZrSi₂O₉-coated specimen has a higher corrosion resistance and superior stability in simulated body fluid (SBF) solution in comparison with the ZnO-coated and bare Mg alloy samples. Antibacterial activities of the uncoated and coated specimens were evaluated against various pathogenic species (*Escherichia coli*, *Klebsiella pneumoniae*, and *Shigella dysenteriae*) via disc diffusion method. The obtained results showed that ZnO and ZnO/Ca₃ZrSi₂O₉ coatings have great zones of inhibition (ZOI) against *E. coli*,

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