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Tribocorrosion behaviors of a biodegradable $Mg_{65}Zn_{30}Ca_5$ bulk metallic glass for potential biomedical implant applications

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Abstract

In this study, the tribological behavior of $Mg_{65}Zn_{30}Ca_5$ BMG under dry friction in air and lubrication friction in phosphate buffered saline (PBS) solution were investigated using ball-on-disk reciprocating sliding. The results were compared with those of AZ31B alloy and pure Mg. The $Mg_{65}Zn_{30}Ca_5$ BMG exhibits the highest dry wear resistance among three Mg-based alloys. Nevertheless, under lubricated sliding in PBS solution, the wear rate of $Mg_{65}Zn_{30}Ca_5$ BMG and pure Mg increases whereas that of AZ31B decreases in comparison with the cases under dry friction. The electrochemical results suggest that the corrosion resistance of Mg-based alloys in PBS solution decreases in the following consequence: AZ31B, $Mg_{65}Zn_{30}Ca_5$ and pure Mg, which results in an accelerated wear rate of $Mg_{65}Zn_{30}Ca_5$ and pure Mg during