Study on the in Vitro Degradation Behavior of Commercial Zn–4%Al–Sr Alloy for Biomedical Applications

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Zn and Zn-based alloys have been recognized as potential biodegradable materials, due to their proven biocompatibility and lower corrosion rates compared to Mg alloys. However, pure Zn has poor mechanical properties while Zn–4wt.% Al alloy (Zn–4Al) degrades in a nonuniform manner. In this study, Sr was used as a promising alloying element to improve the uniform corrosion properties of Zn–4Al alloy. Microstructure and in vitro degradation behavior of Zn–4Al alloys with addition of different concentrations of Sr (0–0.15 wt%) were systematically investigated. Increasing Sr addition progressively decreased the volume fraction of primary η -Zn phase and progressively increased the (β + η) lamellar eutectic morphology. The alloy with 0.1 wt% Sr displayed the best corrosion resistance. Most importantly, the Zn–4Al–0.1Sr alloy exhibited a more uniform corrosion mode in Hanks' solution, which could reduce stress concentration and rapid reduction in the mechanical integrity.

Keywords: Biodegradable metals; Zn-based alloys; strontium; corrosion behavior

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