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Corrosion of Constrained Friction Processed AM50 Alloy in Simulated Body Fluid

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Introduction

Mg alloys: biomedical applications → Biodegradability, biocompatibility and bone-like elastic modulus

Main limitations → High corrosion rates, hydrogen evolution, and low room-temperature formability

Constrained Friction Processing (CFP) → Severe plastic deformation and microstructural refinement

Research Gap → Influence of CFP on AM50 corrosion behavior remains largely unexplored

Materials and Methods

AM50 Mg alloy

Mg-5.21Al-0.47Mn



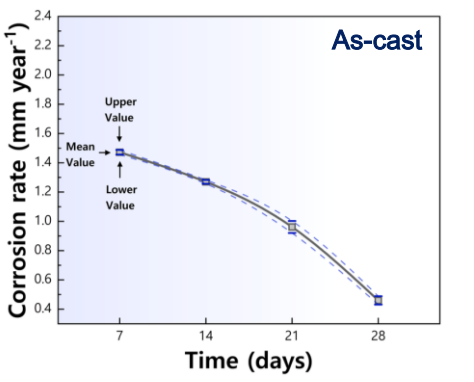
Corrosion evaluation in SBF at 37 ºC

Immersion tests
Mass loss
7, 14, 21 and 28 days

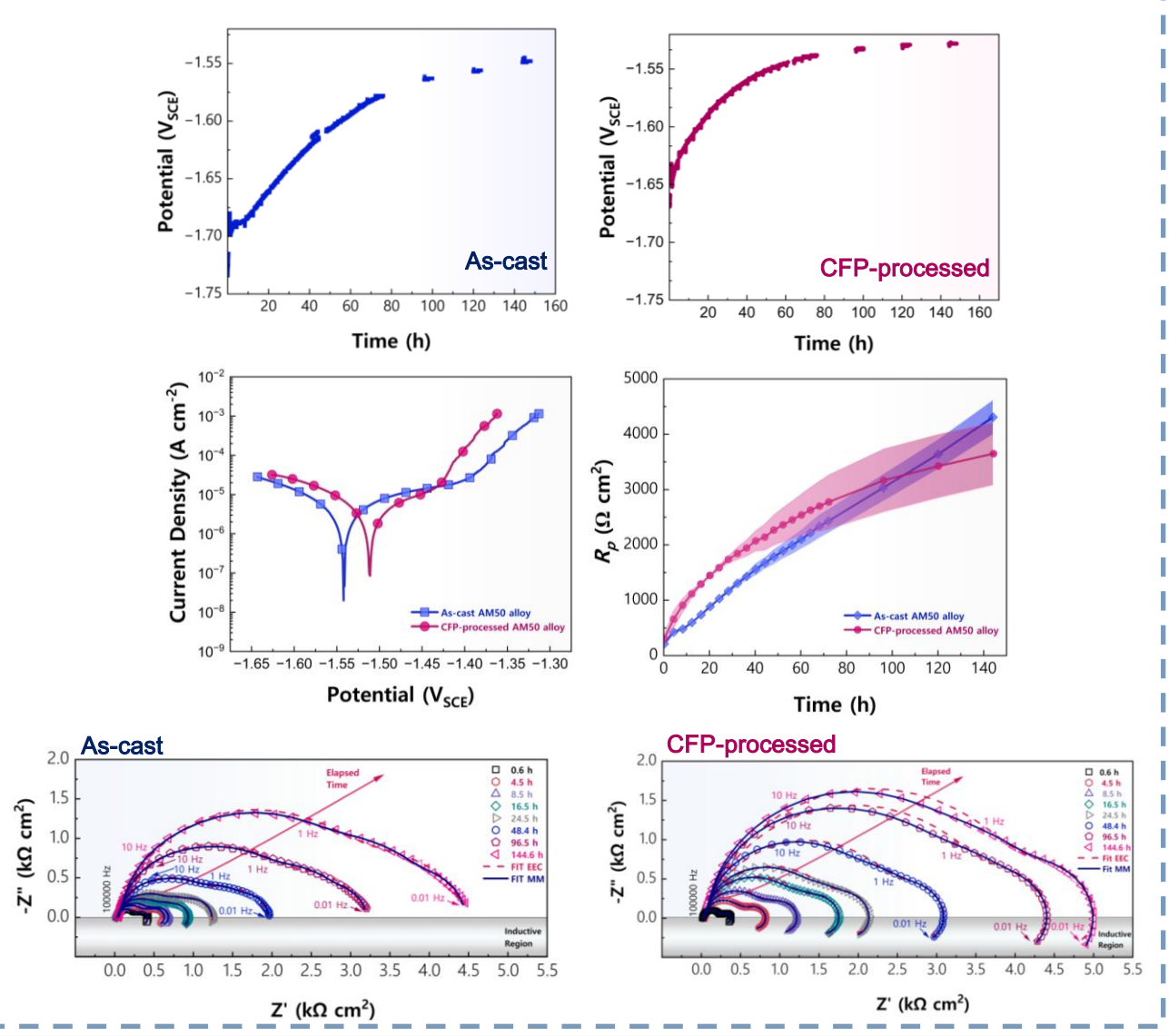
Electrochemical measurements
OCP, LPR, PP, EIS
22 cycles over 144 h

Results and Discussion

Immersion tests



Electrochemical Measurements



Conclusions

- Both conditions developed heterogeneous corrosion-product layers, while time-averaged corrosion rates decreased during immersion, reaching approximately 0.46 and 0.58 mm year^{-1} after 28 days for the as-cast and CFP-processed alloys, respectively.
- CFP initially increased polarization resistance, indicating a modified early electrochemical response; however, this effect diminished with prolonged immersion. Prolonged electrochemical monitoring and mass-loss measurements did not demonstrate a sustained improvement in corrosion resistance for CFP-processed condition.

References

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