

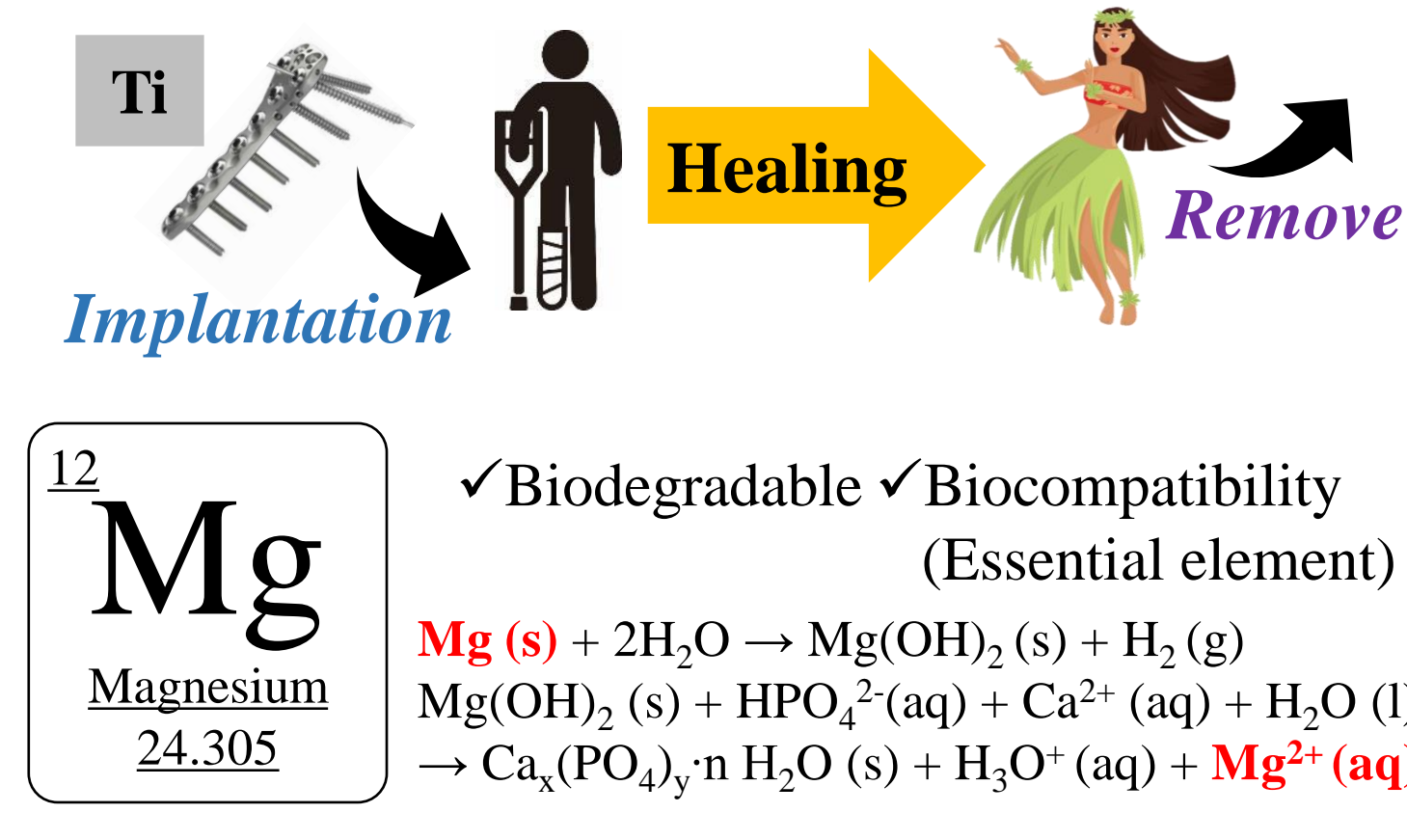


Corrosion Behavior of Pure Magnesium Substrate Coated with Polydopamine Layer in Cell Culture Medium

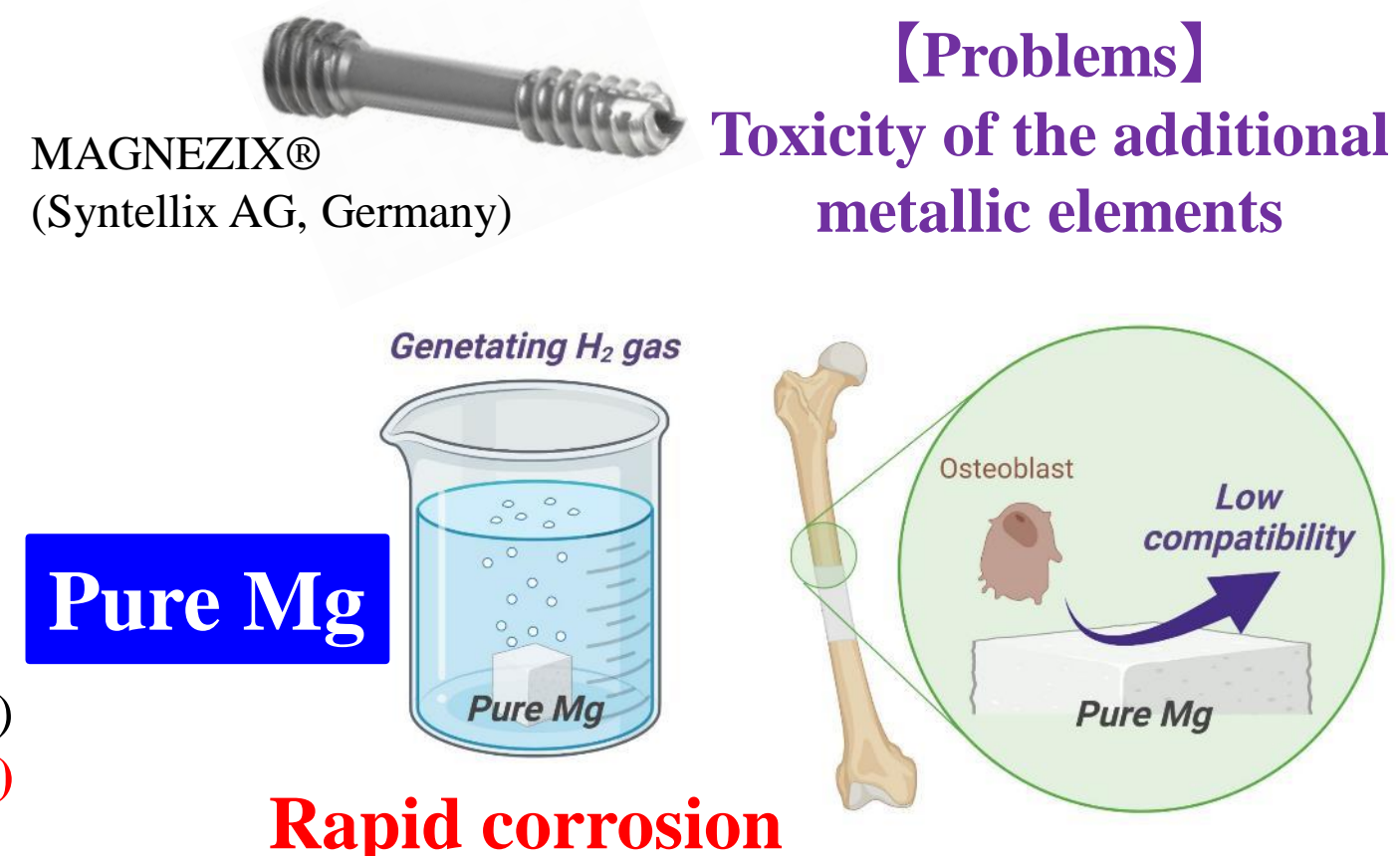
Sayuki Yoshitomi¹, Minori Sugiyama¹, Daiki Sannomiya², Youichi Mizuno², Kunimitu Nakamura², Sachiro Kakinoki^{1,3}

¹Department of Chemistry and Materials Engineering, Graduate School of Science and Engineering, Kansai University ²Japan Fine Steel Co., Ltd ³ORDIST, Kansai University

Introduction



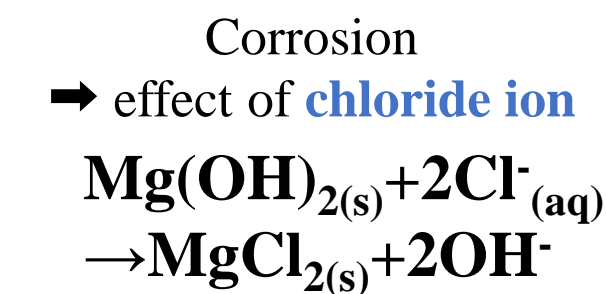
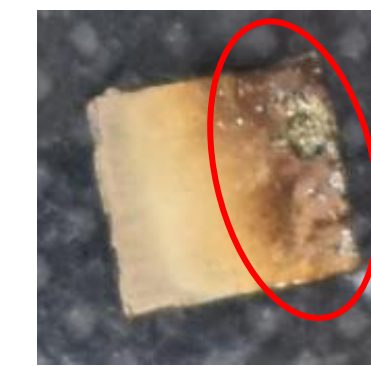
Mg alloys are using for orthopedic surgery.



Results and discussion

Optimization of solvents for pDA coating

Boric acid/potassium chloride buffer



Alexander Kopp et al., Acta Biomater., 98(2019)23

NaOH aqueous solution



pH 9.2 (0.01 M) pH 12.0 (0.05 M) pH 12.5 (0.1 M)

No corrosion of the pure Mg substrate was observed during the reaction in NaOH solution..

Eluting behavior of Mg²⁺ ion in culture medium

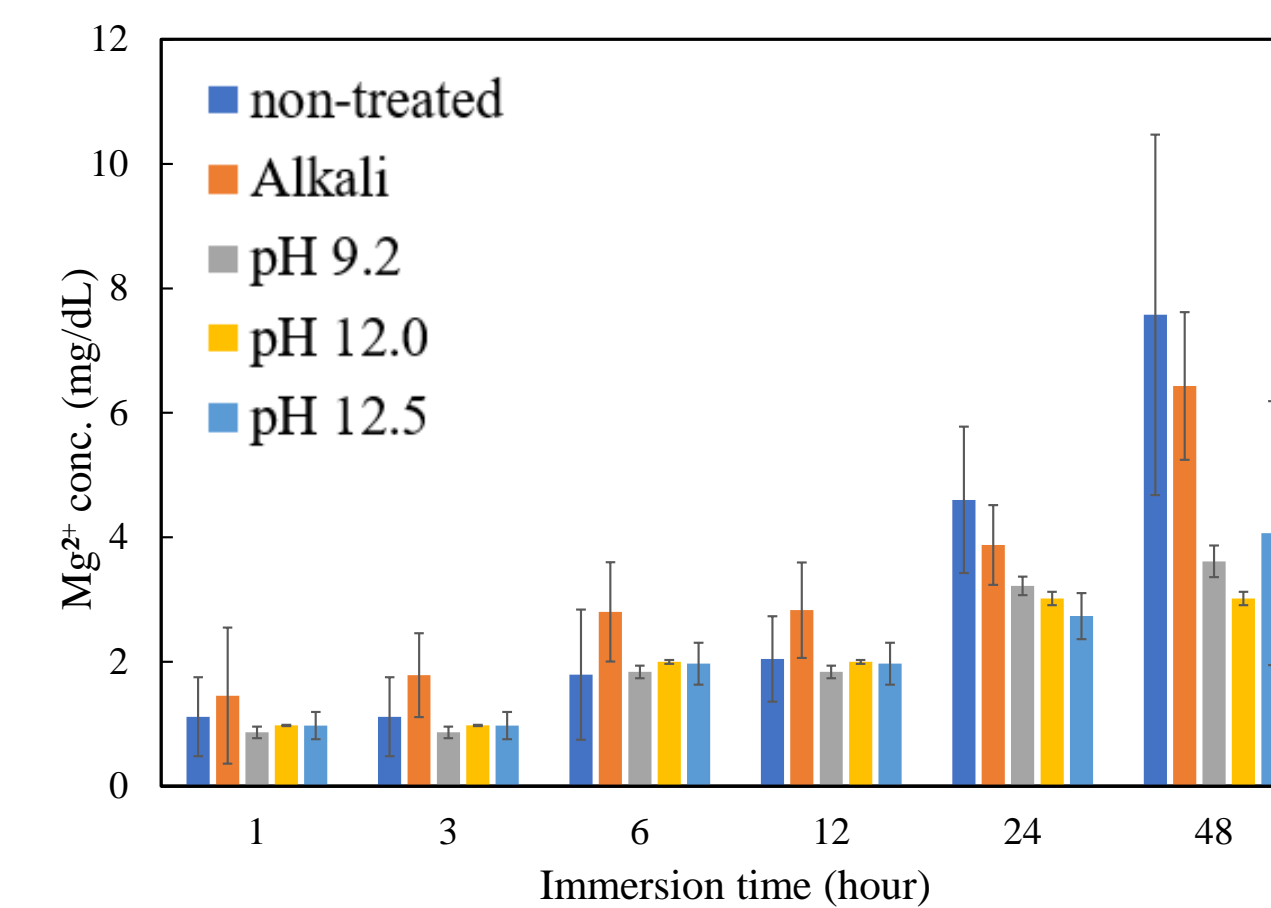


Fig. 2 Eluting behavior of Mg²⁺ ion from pure Mg substrate in cell culture medium (10% FBS).

X-ray photoelectron spectroscopy (XPS)

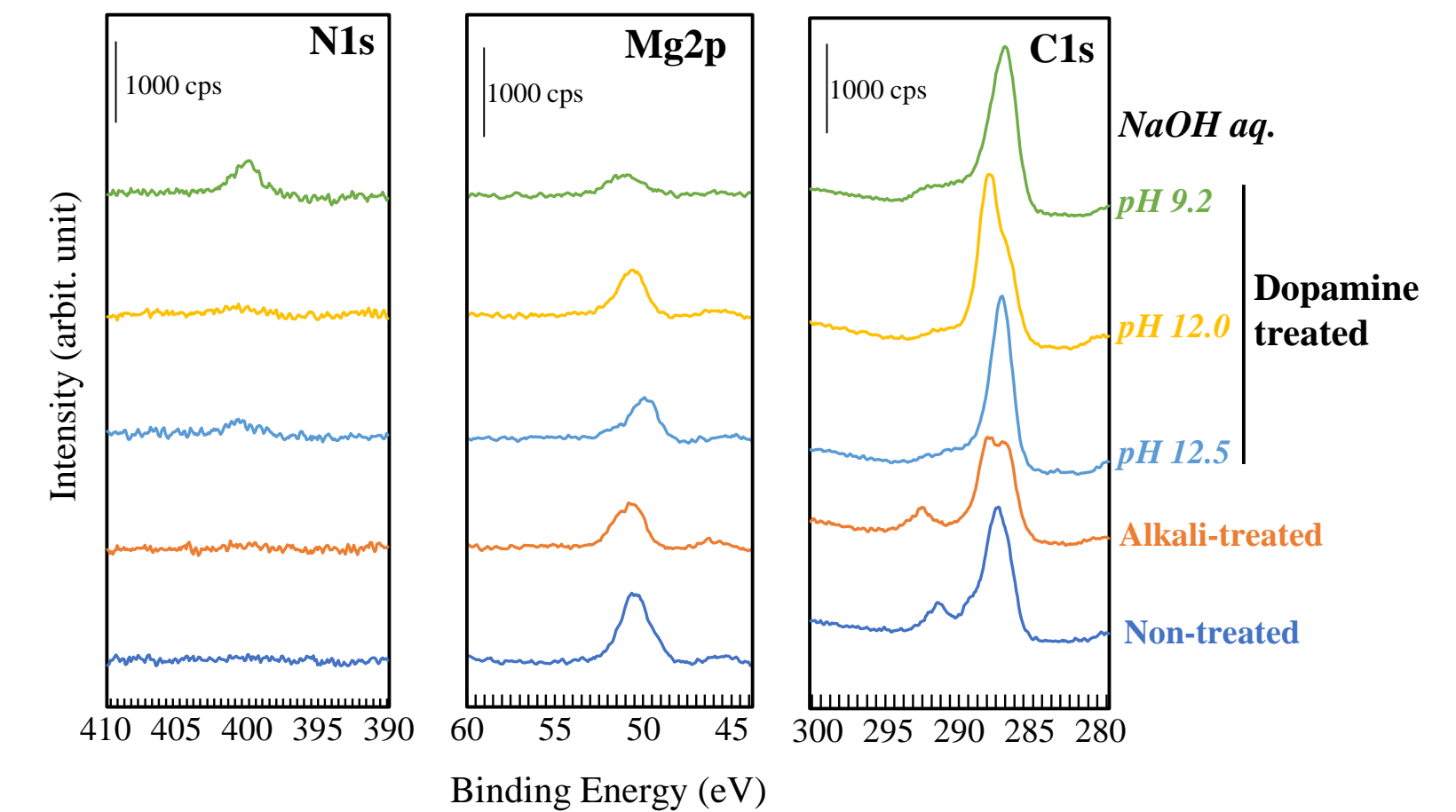


Fig. 1 XPS spectrum of pure Mg surface treated with DA solution. After reaction: DA-derived N1s were detected, and substrate-derived Mg2p was attenuated.

Polydopamine was coated on the pure Mg surface.

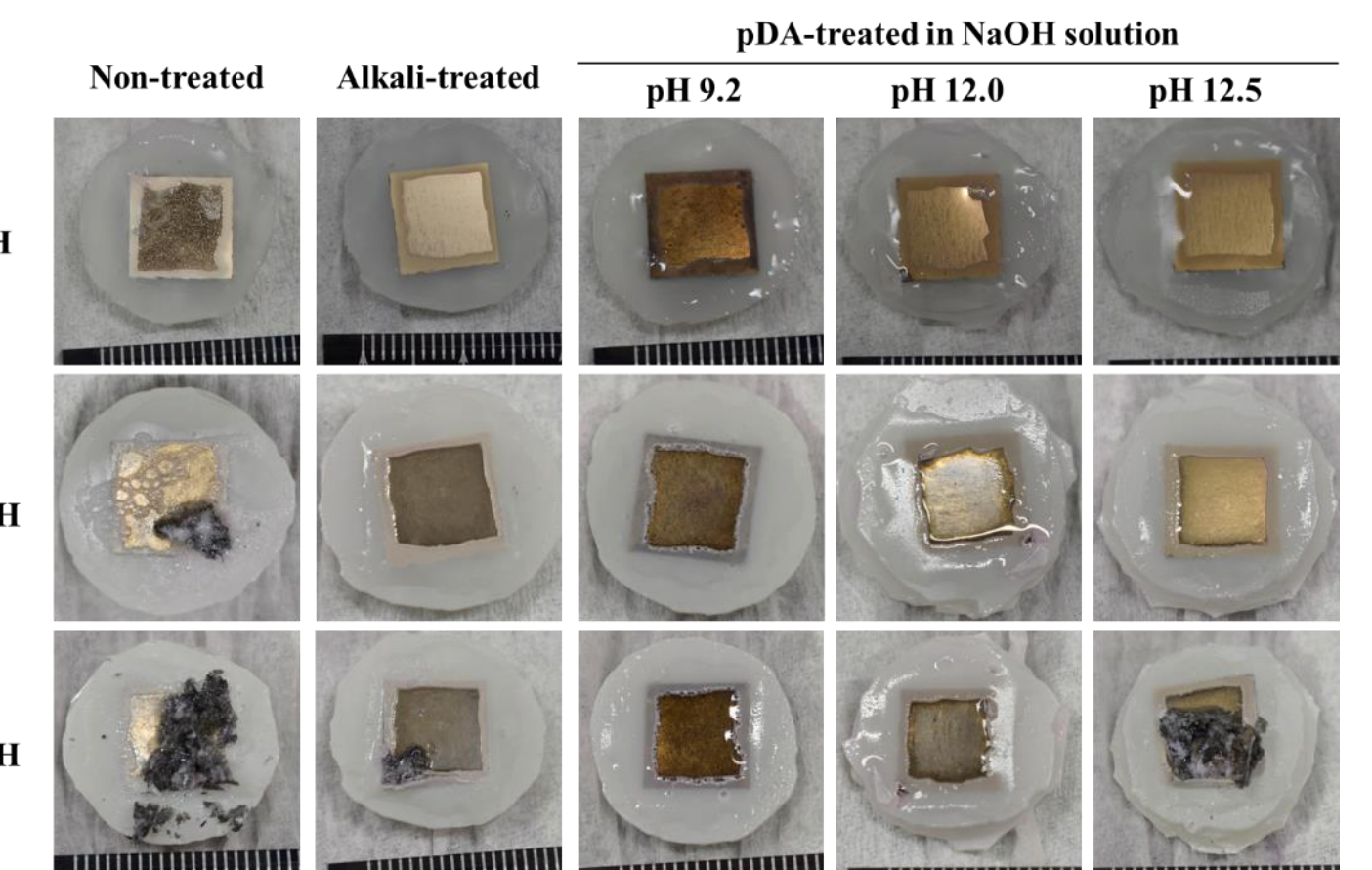
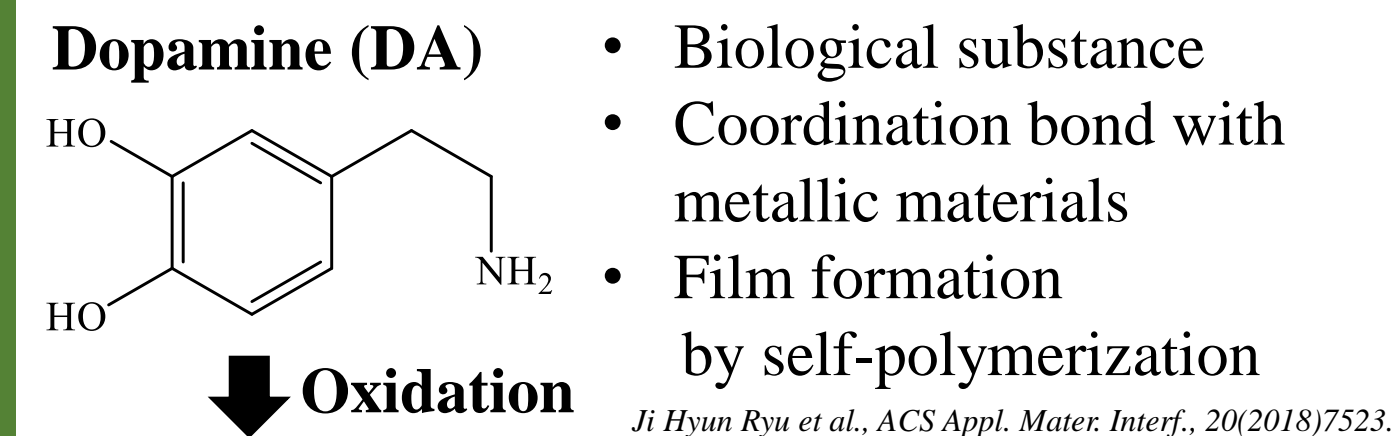


Fig. 3 Corrosion behavior of pDA-treated pure Mg substrate in cell culture medium (10% FBS).

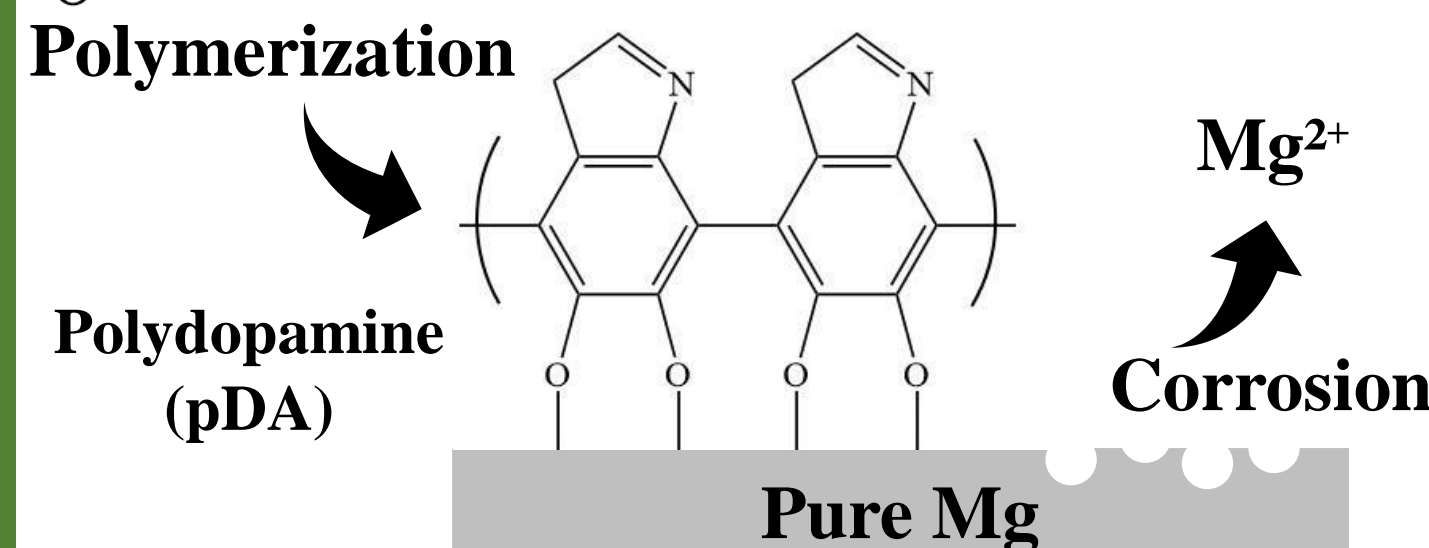
Low Mg²⁺ eluting was found in the case of pDA coated-pure Mg (pH 9.2 or 12.0).

Objective

Inhibition of rapid corrosion of pure Mg

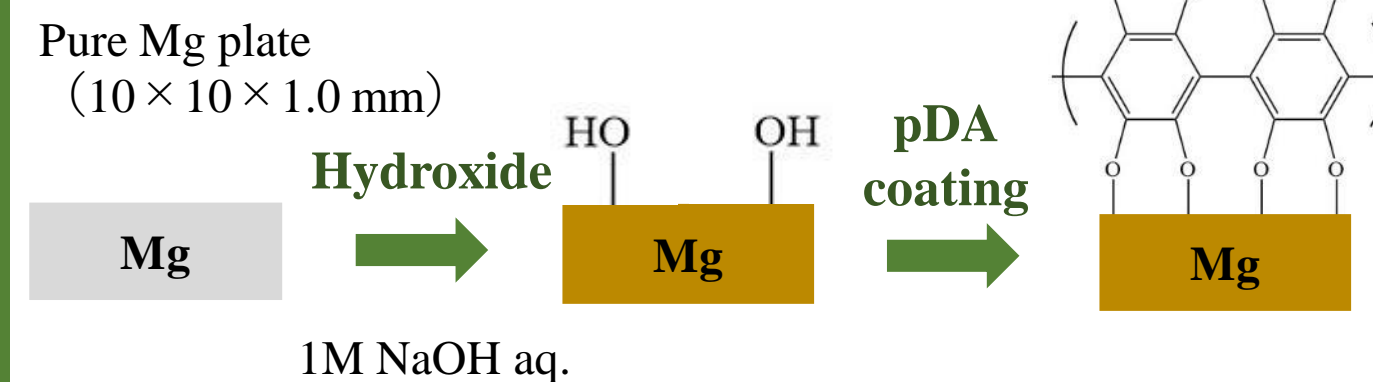


[Problems]
Polydopamine coating and Mg corrosion will be occurring simultaneously.

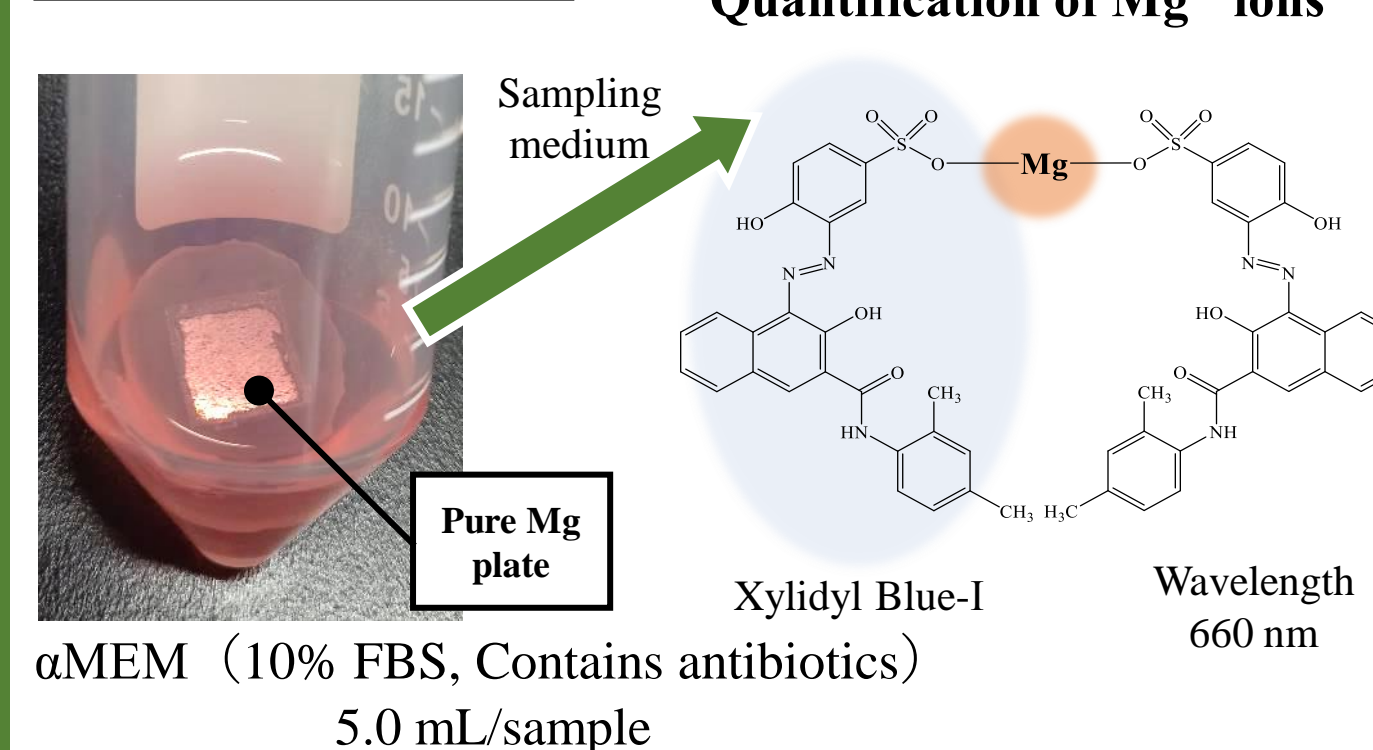


Materials and methods

Examination of pDA coating conditions on pure Mg plates



Decomposition behavior of pure Mg in cell culture medium



Conclusion

- Polydopamine was coated on pure Mg surface via the polymerization reaction in NaOH solution.
- Corrosion decomposition of pure Mg was suppressed by polydopamine coating.