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القسم :- الكيمياء

التخصص:- كيمياء فيزيائية

الدرجة العلمية:- مدرس

-- البحث الاول

## Effect of Al content on the corrosion behavior of Mg–Al alloys in aqueous solutions of different pH

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[Electrochimica Acta Volume 55, Issue 22, 1 September 2010, Pages 6651–6658](#)

### Abstract

The effect of systematic increase of Al content on the electrochemical behavior of the Mg–Al alloys in aqueous solutions of different pH was investigated. Different electrochemical methods such as open-circuit potential measurements, polarization techniques and electrochemical impedance spectroscopy, EIS, were used to investigate the electrochemical behavior of the alloys in aqueous solutions. The results have shown that Mg–5Al is easily corroded due to the microgalvanic effect between  $\alpha$ -phase and  $\beta$ -phase, its corrosion rate is even higher than that of Mg itself. The increase of Al content increases the corrosion resistance of the alloy due to the formation of the  $\beta$ -phase (Mg<sub>17</sub>Al<sub>12</sub>) together with the Mg  $\alpha$ -phase. The ranking of the corrosion rate of these alloys was Mg–5Al > Mg > Mg–

10Al  $\cong$  Mg–15Al. The corrosion rates of the alloys in acidic solutions are pronouncedly high compared to those measured in neutral or basic solutions. The impedance measurements are in consistence with the polarization techniques and the impedance data were fitted to theoretical data obtained according to an equivalent circuit model describing the electrode/electrolyte interface.