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Authors: Toko Tokunaga, Munekazu Ohno, Kiyotaka  
Matsuura



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## Coatings on Mg alloys and their mechanical properties: A review

Toko Tokunaga, Munekazu Ohno, Kiyotaka Matsuura\*

Faculty of Engineering, Hokkaido University, Kita 13 Nishi 8, Kita-ku, Sapporo, Hokkaido 060-8628, Japan

\*Corresponding author.

E-mail address: matsuura@eng.hokudai.ac.jp (K. Matsuura).

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Poor corrosion resistance is a serious drawback of Mg alloys, restricting their practical applications. Coating is one of the effective techniques for improvement in the poor corrosion resistance. In this paper, the coating processes for Mg alloys so far developed are reviewed. Among several processes, the coating processes based on mechanical energy, including metal forming, are attractive because the corrosion resistance and formability of Mg alloys are simultaneously improved.

### Keywords:

Magnesium alloy; Coating; Mechanical property; Corrosion resistance

### 1. Introduction

Magnesium (Mg) alloys have attracted considerable attention because of their lowest density in structural metallic materials for practical use [1, 2]. Weight saving in automotive industry is increasingly in demand to resolve the environmental issues such as reduction of CO<sub>2</sub> emission. Density of Mg alloys is about 1/4 of Fe and 2/3 of Al. Therefore, significant weight saving, for instance, of automobiles can be realized by replacing steels and/or Al alloys used in the components with Mg alloys. However, the practical applications of Mg alloys are still limited due to their serious disadvantages, e.g., extremely poor corrosion resistance. Because of their high chemical activity, Mg alloys are easily corroded even in the air at room temperature. This serious disadvantage must be surmounted and great efforts have been so far devoted to improvement in corrosion resistance.

Two main kinds of approaches have been proposed for improving corrosion resistance of Mg alloys; one is alloying [3] and the other is coating [4]. In the former approach, it is known that the addition of Al, Zn, Mn and rare-earth elements improves the corrosion resistance of Mg alloys [5, 6]. Cao et al. [7] extensively summarized the effects of alloying elements on corrosion rate. For example, corrosion rates of AM50 (4.0-4.9Al-0.21-0.26Mn (wt.%)) and AZ91D (8.1-8.9Al-0.52Zn

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