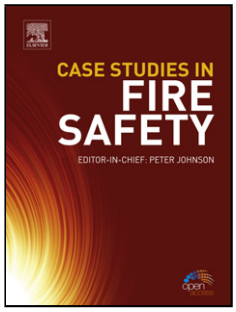

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Comprehensive screening of Mg corrosion inhibitors

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HIGHLIGHTS

- 151 chemical compounds are tested towards their inhibiting effect on Mg alloys
- New inhibitors are tested on AZ31, AZ91, AM50, WE43, ZE41, Elektron 21 and three grades of pure magnesium
- The extensive database of magnesium corrosion inhibitors is set up
- A number of new inhibitors are discovered with efficiency exceeding that of chromate
- The salts of pyridinedicarboxylic and salicylic acids are the most efficient and universal Mg corrosion inhibitors

Abstract

This work presents the results of a systematic screening for magnesium corrosion inhibitors. The ability to form stable soluble complexes with $Fe^{ii/iii}$ was considered on first place when choosing the compounds for hydrogen evolution tests. Inhibiting effect of 151 individual compounds was tested towards six alloys (AZ31, AZ91, AM50, WE43, ZE41 and Elektron 21) and three grades of pure magnesium. Newly identified and previously reported inhibitors are ranked by their inhibiting efficiency and compared with Cr (VI) reference. A number of new inhibitors are discovered with efficiency exceeding that of chromate.

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Keywords: Magnesium corrosion • corrosion inhibition • magnesium inhibitor •magnesium complex• chelate

1. Introduction

Efficient surface and coating technology for magnesium is a well-known challenge. Surface pre-conditioning [1], [2-5] and various types of coating technologies [6-8] are typically adapted to fit the requirements given by the magnesium material application and possible corrosion exposure scenarios. These facts indicate that a more general viable technology would be a great benefit. Such a technology can be achieved by efficient corrosion inhibitors embedded into various types of conventional surface treatments [8-10]. However, efficient and environmentally friendly corrosion inhibitors are lacking. Reviews on corrosion inhibitors for Mg alloys are scarce: perhaps, only one comprehensive review has been published recently [11].