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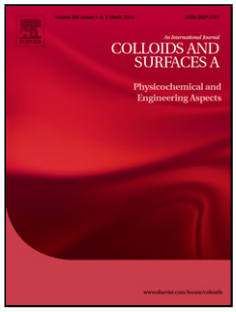

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Current status, opportunities and challenges in chemical conversion coatings for zinc

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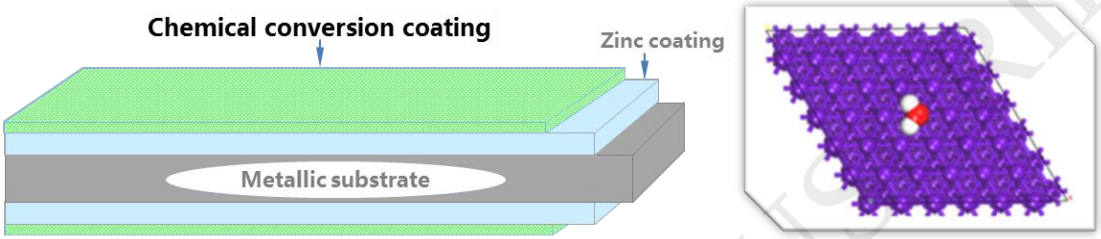
Graphical Abstract



Abstract

The susceptibility of Zn-based materials to corrosion in an aggressive environment limits their broad applications. Innovative conversion treatment is the most interesting approach for enhanced corrosion performance of zinc. This review covers recent research that has led to advances in conversion coating technology for zinc; including the application of contemporary methods for chemical conversion coating, the establishment of a corrosion protection framework for zinc, the illumination of processing control effects, and the attempts at the inhibition mechanisms of zinc by coatings. This review drawing from many sources provides an impartial focus on new achievements. The environmentally acceptable conversion coating is reviewed in detail. This review also covers engineering application aspects, including cost-effectiveness technology and process productivity. Finally, future prospects and present challenges in the field of conversion treatment are reviewed, identifying the demerit of each technique, meanwhile attempting to also identify future developments and directions.

Key words: Corrosion; Conversion coating; Zinc; Molybdate; Silane; Degradability

Introduction

There has been a significant amount of research undertaken in chemical conversion coatings when various comprehensive reviews were written in this area. Table 1 illustrates the reported works from selected authors. Previous reviews examined the effectiveness of conversion coatings for several metal substrates involving Zn, Al, Mg and their alloys. From these reviews, large amounts of useful information can be abstracted and be used to focus on the application of conversion coatings for zinc-based