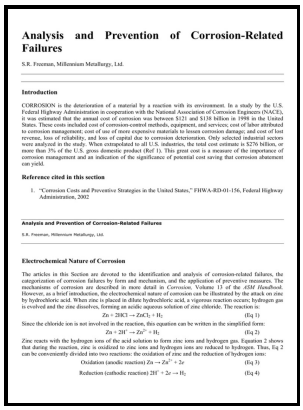
Study of Surface Carbides, Differential Steel Attack and Pore Formation in the Galvanizing Process.

s.n - Effect of chromium on the rate of carbide formation processes during tempering



Analysis and Prevention of Corrosion-Related Failures

S.R. Freeman, Millennium Metallurgy, Ltd.

Introduction

CORROSION is the deterioration of a material by a reaction with its environment. In a study by the U.S. Federal Highway Administration in cooperation with the National Association of Corrosion Engineers (NACE), it was estimated that the annual cost of corrosion was between $121 and $138 billion in 1998 in the United States. These costs included cost of corrosion-control methods, equipment, and services; cost of labor attributed to corrosion management; cost of use of more expensive materials to lessen corrosion damage; and cost of lost revenue, loss of reliability, and loss of capital due to corrosion deterioration. Only selected industrial sectors were analyzed in the study. When extrapolated to all U.S. industries, the total cost estimate is $276 billion, or more than 3% of the U.S. gross domestic product (Ref 1). This great cost is a measure of the importance of corrosion management and an indication of the significance of potential cost saving that corrosion abatement can yield.

Reference cited in this section

1. "Corrosion Costs and Preventive Strategies in the United States," FHWA-RD-01-156, Federal Highway Administration, 2002

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Electrochemical Nature of Corrosion

The articles in this Section are devoted to the identification and analysis of corrosion-related failures, the corrosion mechanisms involved, the factors affecting the form and mechanism, and the application of preventive measures. The mechanisms of corrosion are described in more detail in *Corrosion*, Volume 13 of the *ASM Handbook*. However, as a brief introduction, the electrochemical nature of corrosion can be illustrated by the attack on zinc by hydrochloric acid. When zinc is placed in dilute hydrochloric acid, a vigorous reaction occurs; hydrogen gas is evolved and the zinc dissolves, forming an acidic aqueous solution of zinc chloride. The reaction is:

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2 \quad \text{(Eq 1)}$$

Since the chloride ion is not involved in the reaction, this equation can be written in the simplified form:

$$Zn + 2H^+ \rightarrow Zn^{2+} + H_2 \quad \text{(Eq 2)}$$

Zinc reacts with the hydrogen ions of the acid solution to form zinc ions and hydrogen gas. Equation 2 shows that during the reaction, zinc is oxidized to zinc ions and hydrogen ions are reduced to hydrogen. Thus, Eq 2 can be conveniently divided into two reactions: the oxidation of zinc and the reduction of hydrogen ions:

$$\text{Oxidation (anodic reaction) } Zn \rightarrow Zn^{2+} + 2e \quad \text{(Eq 3)}$$

$$\text{Reduction (cathodic reaction) } 2H^+ + 2e \rightarrow H_2 \quad \text{(Eq 4)}$$

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Mechanisms of pore formation in high

The obtained hardness decreased as the homogenisation temperature and time increased.

Surface and Bulk Carbide Transformations in High

Several concerted studies have been oriented towards an understanding of the mechanisms of irradiation creep IC and theories developed invoke processes involving dislocation climb with point defect mobility as the rate-controlling process. BARRY WISKEL, OLADIPO OMOTOSO, HANI HENEIN, and DOUGLAS G. Although Bain established the basic understanding of kinetics of ferrous phase transformations by transformations at constant temperature, practical heat treatments are carried out by heating and cooling at various rates.

Engineering 1958 Jul

Strong carbide former; the carbides form hard, abrasion-resistant particles in tool steels.

Surface and Bulk Carbide Transformations in High

This microstructure develops during the solidification process, which is sketched in. First and second phosphor layers must be different materials to assure that the spectral lines collected will be distinguishable.

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Carbide formation mechanism during solidification and annealing of 17% Cr

This means that initially, at a fairly slow cooling rate, austenite was transforming to pearlite, as evidenced by the pearlite nodules. Those irons that have a mixed gray and white appearance are called mottled iron.

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