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Metallic and other inorganic coatings — Post-coating treatments of iron or steel to reduce the risk of hydrogen embrittlement

*Revêtements métalliques et autres revêtements inorganiques —
Traitements après revêtement sur fer ou acier pour diminuer le risque
de fragilisation par l'hydrogène*



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Foreword

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ISO 9588 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*.

This second edition cancels and replaces the first edition (ISO 9588:1999), Table 1 of which has been technically revised and replaced with Tables 1 and 2.

Introduction

When atomic hydrogen enters steels and certain other metals, for example aluminium and titanium alloys, it can cause loss of ductility or load-carrying ability, or cracking (usually as sub-microscopic cracks), or catastrophic brittle failures at applied stresses well below the yield strength, or even the normal design strength, for the alloys. This phenomenon often occurs in alloys that show no significant loss in ductility, when measured by conventional tensile tests, and is frequently referred to as hydrogen-induced delayed brittle failure, hydrogen stress cracking or hydrogen embrittlement. The hydrogen can be introduced during cleaning, pickling, phosphating, electroplating and autocatalytic processes, as well as in service as a result of cathodic protection or corrosion reactions. Hydrogen can also be introduced during fabrication prior to cleaning, pickling and application of coatings, for example, during roll forming, machining and drilling, due to the breakdown of unsuitable lubricants, as well as during welding or brazing operations.

The susceptibility to hydrogen embrittlement, resulting from the absorption of atomic hydrogen and/or the tensile stresses induced during fabrication, can be reduced by heat treatment. The time-temperature relationship of the heat treatment is dependent on the composition and structure of steels, as well as on the specific coatings being applied and the nature of the coating procedures. For most high-strength steels, the effectiveness of the heat treatment falls off rapidly with reduction of time and temperature.

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