



Designation: B 874 – 96

## Standard Specification for Chromium Diffusion Coating Applied by Pack Cementation Process<sup>1</sup>

This standard is issued under the fixed designation B 874; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the requirements for chromium diffusion of metals by the pack cementation method. Pack diffusion employs the chemical vapor deposition of a metal which is subsequently diffused into the surface of a substrate at high temperature. The material to be coated (substrate) is immersed or suspended in a powder containing chromium (source), a halide salt (activator), and an inert diluent such as alumina (filler). When the mixture is heated, the activator reacts to produce an atmosphere of chromium halides which transfers chromium to the substrate for subsequent diffusion. The chromium-rich surface enhances corrosion, thermal stability, and wear-resistant properties.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- B 374 Terminology Relating to Electroplating<sup>2</sup>
- B 487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section<sup>2</sup>
- B 602 Test Method for Attribute Sampling of Metallic and Inorganic Coatings<sup>2</sup>
- B 697 Guide for Selection of Sampling Plans for Inspection of Metallic and Inorganic Coatings<sup>2</sup>
- B 762 Method of Variables Sampling for Metallic and Inorganic Coatings<sup>2</sup>
- C 664 Test Methods for Thickness of Diffusion Coatings<sup>2</sup>
- D 3951 Practice for Commercial Packaging<sup>3</sup>
- E 3 Methods of Preparation of Metallographic Specimens<sup>4</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.15 on Diffusion Coatings.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.09.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 03.01.

- E 766 Practice for Calibrating Magnification of a Scanning Electron Microscope<sup>4</sup>
- E 1077 Test Method for Estimating Depth of Decarburization of Steel Specimens<sup>4</sup>
- F 1330 Guide for Metallic Abrasive Blasting to Descale the Interior of Pipe<sup>5</sup>

### 3. Terminology

3.1 Definitions used in this specification are in accordance with Terminology B 374.

#### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *diffusion coating*—a diffusion coating is one produced by causing an element to react with or diffuse into, or both, the surface of a metallic substrate, thus, chemically altering the surface of the substrate.

3.2.2 *retorts*—containers in which powder and parts are packed for processing. They can be constructed of carbon, stainless, or high alloys and fabricated in all shapes and sizes to accommodate parts being processed.

3.2.3 *significant surface*—areas that are essential to the serviceability or function of the article. These surfaces must be identified on a drawing or marked-up sample of product. Areas can fall into one of three categories as follows:

3.2.4 *coating required*—these surfaces must be in accordance with all quality requirements of this specification.

3.2.5 *no coating required*—these surfaces are areas where no coating is allowed due to a number of reasons including dimensional, fabrication, and welding, as well as others. Materials used for masking are commercially available.

3.2.6 *optional*—these surfaces do not require coating, but at the same time do not require masking.

### 4. Classification

4.1 There are four classes of chromium diffusion defined by base (basis) metal category.

4.1.1 *Class I*—Carbon steel.

4.1.2 *Class II*—Low-alloy steels.

4.1.3 *Class III*—Stainless steels.

4.1.4 *Class IV*—Nickel-based alloys.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 01.07.