

This is a preview of "ISO 4527:2003". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2003-05-15

Metallic coatings — Autocatalytic (electroless) nickel-phosphorus alloy coatings — Specification and test methods

*Revêtements métalliques — Dépôts autocatalytiques (sans courant)
d'alliages de nickel-phosphore — Spécifications et méthodes d'essai*



Reference number
ISO 4527:2003(E)

© ISO 2003

This is a preview of "ISO 4527:2003". [Click here to purchase the full version from the ANSI store.](#)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

This is a preview of "ISO 4527:2003". [Click here to purchase the full version from the ANSI store.](#)

Contents

Page

| | |
|--|----|
| Foreword..... | iv |
| Introduction | v |
| 1 Scope..... | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions..... | 2 |
| 4 Information to be supplied to the producer of the coating..... | 3 |
| 4.1 Essential information..... | 3 |
| 4.2 Additional information..... | 3 |
| 5 Designation of basis metal, metal layers and heat treatment requirements | 4 |
| 5.1 General | 4 |
| 5.2 Designating the basis metal..... | 4 |
| 5.3 Designation of heat treatment requirements | 4 |
| 5.4 Designating the type and thickness of metal layers | 5 |
| 5.5 Examples of designations..... | 5 |
| 6 Requirements | 5 |
| 6.1 Special test specimens..... | 5 |
| 6.2 Appearance..... | 5 |
| 6.3 Surface finish | 6 |
| 6.4 Thickness..... | 6 |
| 6.5 Hardness | 6 |
| 6.6 Adhesion | 6 |
| 6.7 Porosity | 6 |
| 6.8 Corrosion resistance | 6 |
| 6.9 Stress relief heat treatment prior to coating | 7 |
| 6.10 Hydrogen embrittlement relief heat treatment after coating | 7 |
| 6.11 Heat treatment to harden the coating | 7 |
| 6.12 Heat treatment to improve adhesion..... | 7 |
| 6.13 Wear resistance..... | 7 |
| 6.14 Solderability..... | 8 |
| 6.15 Chemical composition..... | 8 |
| 6.16 Peening of metal parts..... | 8 |
| 6.17 Undercoats and overcoats | 8 |
| 7 Sampling | 8 |
| Annex A (normative) Heat treatment to improve adhesion and increase hardness | 9 |
| Annex B (informative) Thickness test methods | 12 |
| Annex C (informative) Guidance on thickness, composition and use of autocatalytic nickel-phosphorus coatings | 15 |
| Annex D (normative) Methods for chemical analysis of autocatalytic nickel coatings for phosphorus content | 18 |
| Bibliography | 22 |

This is a preview of "ISO 4527:2003". [Click here to purchase the full version from the ANSI store.](#)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4527 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 4527:1987), which has been technically revised.

This is a preview of "ISO 4527:2003". [Click here to purchase the full version from the ANSI store.](#)

Introduction

Autocatalytic nickel-phosphorus alloy coatings are produced by the catalytic reduction of nickel ions in hot, usually mildly acidic solutions at atmospheric pressure using hypophosphite ion as the reducing agent. Because the deposited nickel alloy is a catalyst for the reaction, the process is self-sustaining. The coatings produced are uniform in thickness on irregularly shaped parts if the processing solution circulates freely over their surfaces.

The as-deposited coating is a thermodynamically metastable, supersaturated solid solution of phosphorus in nickel containing up to 14 % mass fraction phosphorus. The physical and chemical properties and the structure of autocatalytic nickel-phosphorus coatings are dependent on the composition of the coating, the chemical make-up of the plating solution, the pre-treatment and quality of the substrate, and heat treatment after deposition.

Autocatalytic nickel-phosphorus coatings are applied in order to improve corrosion protection and to provide wear resistance. In general, corrosion performance is significantly improved as the phosphorus content of the deposit is increased to 8 % mass fraction or higher, whereas wear resistance is improved as the phosphorus content of the coating is decreased below that level. With suitable heat treatment however, coatings with high phosphorus contents display greatly improved microhardness and hence, wear resistance.