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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 20972.3-2025

**Petroleum and natural gas industries - Materials for use in
H₂S-containing environments in oil and gas production - Part 3:
Cracking-resistant CRAs(corrosion-resistant alloys) and other alloys**

石油天然气工业 油气开采中用于含硫化氢环境的材料 第3部分：抗开裂耐蚀合金
和其他合金

(English Translation)

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 3 of GB/T 20972 "Materials for use in hydrogen sulfide environments in oil and gas production in the petroleum and natural gas industry".

GB/T 20972 has published the following parts.

- Part 1: General principles for selecting crack-resistant materials;
- Part 2: Cracking resistant carbon steel, low alloy steel and cast iron;
- Part 3: Cracking and corrosion resistant alloys and other alloys.

This document replaces GB/T 20972.3-2008 "Materials for use in hydrogen sulfide environments in oil and gas production in the petroleum and natural gas industry Part 3 Part 2: Cracking and Corrosion Resistant Alloys and Other Alloys. Compared with GB/T 20972.3-2008, in addition to structural adjustments and editorial changes, the main changes are the technical changes are as follows.

- a) The scope of application of this document has been changed (see Chapter 1, Chapter 1 of the 2008 edition);
- b) Added the term and definition of "double brand" (see 3.4);
- c) The environmental and material restrictions for austenitic stainless steel used as any equipment or component have been changed (see Table B.2, Table A.2 of the 2008 edition);
- d) The application environment and material restriction requirements of UNS20910 have been changed (see Table B.3, Table A.3 of the 2008 edition);
- e) Added material group 4f of solid solution nickel-based alloy and its restriction requirements (see Table B.12 and Table B.13);
- f) Changed the application environment and material restriction requirements for martensitic stainless steel (see Table B.18, Table B.19, Table B.23 and Table B.27, 2008 Tables A.18, A.19, A.23 and A.27 of the 2014 edition);
- g) The environmental and material restrictions for duplex stainless steel used as any equipment or component have been changed (see Table B.24, Table A.24 of the 2008 edition);
- h) Changed the environmental and material restrictions for precipitation-hardened nickel-based alloys used in any equipment or components (see Table B.32 and Table B.33, Table A.32 and Table A.33 of the 2008 edition);
- i) The application environment and material restriction requirements for cobalt-based alloys have been changed (see Table B.40, Table A.40 of the 2008 edition);
- j) Changed the environmental and material restriction requirements for titanium alloys used as any equipment or components (see Table B.41, Table A.41 of the 2008 edition);
- k) Added the sampling and analysis requirements for the chemical composition of corrosion-resistant alloy cladding layers (see B.13.2).

This document is modified to adopt ISO 15156-3:2020 "Materials for use in hydrogen sulfide environments in oil and gas production in the petroleum and natural gas industry"

Part 3: Cracking and corrosion resistant alloys and other alloys.

This document has the following structural adjustments compared to ISO 15156-3:2020.

- Added Appendix A;
- Appendix B corresponds to Appendix A in ISO 15156-3:2020;
- Appendix C corresponds to Appendix B in ISO 15156-3:2020;
- Appendix D corresponds to Appendix C in ISO 15156-3:2020;
- Appendix E corresponds to Appendix D in ISO 15156-3:2020;
- Added Appendix F.

This document has many technical differences compared to ISO 15156-3:2020.

A list of these technical differences and their reasons is given in Appendix A.

The following editorial changes were made to this document.

- Added notes on the interpretation of stainless steel terms (see 3.12);
- Added notes on the explanation of the production environment (see 6.1);
- Deleted the note in the ISO 15156-3:2020 hardness test method requirements (see 6.2.2.2.2);
- Deleted the note of ISO 15156-3:2020A.13 (see B.13);
- Added the technical requirement of "specific components should be evaluated and determined" when using martensitic stainless steel (see Table B.23 Note);
- Footnote b of Table A.24 of ISO 15156-3:2020 is deleted and used as the content of the middle section of the table (see Table B.24).
- Deleted footnote c and note in Figure B.1 of ISO 15156-3:2020 (see Figure C.1);
- Changed the tensile test execution standard in ISO 15156-3:2020B.3.4 (see C.3.4);
- Changed the implementation standard of Note 2 in ISO 15156-3:2020B.3.5.1 (see C.3.5.1);
- Deleted footnote e in Table C.1 of ISO 15156-3:2020 (see Table D.1);
- Deleted footnote b in Table C.2 of ISO 15156-3:2020, and changed the implementation standard for the description of the use environment in Table C.2 (see Table D.2);
- Added informative Appendix A "Structural adjustments and technical differences between this document and ISO 15156-3:2020 and their reasons" (see Appendix A);

--- Added informative Appendix F "Chemical composition and other information of materials", which mainly involves the chemical composition and other information of materials.

For user use (see Appendix F).

Introduction

Sulfide stress cracking and stress corrosion cracking are dangerous failure forms in the production of hydrogen sulfide oil and gas.

Equipment materials may crack rapidly and unpredictably, causing great loss of life and property.

The purpose of this standard is to standardize the crack resistance of materials used in hydrogen sulfide environments in oil and gas production.

The material evaluation, selection and application requirements were formulated with reference to ISO 15156 and other relevant domestic and foreign standards, and also absorbed the recent developments in acidic oil the research results and practical experience of basic research on gas field engineering applications and technical standards are planned to be composed of three parts.

--- Part 1: General principles for selecting crack-resistant materials. The purpose is to establish general principles for service environment definition, material evaluation and selection.

in principle.

--- Part 2: Cracking resistant carbon steel, low alloy steel and cast iron. The purpose is to establish the selection, assessment and Requirements for use, and requirements for use of cast iron.

--- Part 3: Cracking and corrosion resistant alloys and other alloys. The purpose is to establish the selection, evaluation and Standard and use requirements, including austenitic stainless steel, martensitic stainless steel, ferritic stainless steel, duplex stainless steel, nickel-based alloys, titanium alloys Jin et al.

Oil and gas industry oil and gas production Materials for use in environments containing hydrogen sulfide Part 3: Cracking and corrosion resistant alloys and other alloys

1 Scope

This document specifies the corrosion resistant alloys (CRA) and other alloys for equipment in hydrogen sulfide (H₂S) environments in oil and gas production and natural gas processing plants.