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

GB/T 43905.5-2024

**Laboratory method for sampling fume and gases in welding and allied processes-Part 5:
Identification of thermal-degradation products generated when welding or cutting
through products composed wholly or partly of organic materials using pyrolysis-gas
chromatography-mass spectrometry**

**焊接及相关工艺中烟尘和气体取样的实验室方法 第5部分：基于热解-气相色谱-
质谱法的焊接或切割中有机材料热降解物的识别**

(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 5 of GB/T 43905 "Laboratory methods for sampling of fumes and gases during welding and allied processes":

The following parts have been published:

- Part 1: Determination of fume emission rate during arc welding and collection of fume for analysis;
- Part 2: Determination of emission rates of carbon monoxide, carbon dioxide, nitric oxide and nitrogen dioxide during arc welding, cutting and gouging;
- Part 3: Determination of ozone emission rate during arc welding;
- Part 4: Emission limits of welding fume from welding materials;

--- Part 5: Identification of thermal degradation products of organic materials during welding or cutting based on pyrolysis-gas chromatography-mass spectrometry;

--- Part 6: Quantitative determination of smoke and gases during resistance spot welding:

This document is modified from ISO 15011-5:2011 "Health and safety for welding and allied processes - Laboratory methods for sampling fumes and gases":

Identification of thermal degradation products of organic materials during welding or cutting based on pyrolysis-gas chromatography-mass spectrometry:

The technical differences between this document and ISO 15011-5:2011 and their reasons are as follows:

--- Added normative references GBZ 2.1 and GBZ/T 224 (see Chapter 3) to apply my country's technical requirements:

The following editorial changes were made to this document:

--- According to the content and scope of application of the standard, the name of the standard is changed to "Laboratory Methods for Sampling of Fumes and Gases in Welding and Allied Processes" Part 5: Identification of thermal degradation products of organic materials during welding or cutting based on pyrolysis-gas chromatography-mass spectrometry;

--- The informative reference GB/T 43905.1 replaces ISO 15011-1, and GB/T 43905.2 replaces ISO 15011-2 (see Introduction) to adapt to my country's technical requirements:

--- Deleted the unused terms "chemical substance" and "occupational exposure limit" (see 3.1 and 3.2 of ISO 15011-5:2011):

Introduction

GB/T 43905 "Laboratory methods for sampling of fumes and gases during welding and related processes" provides laboratory methods for sampling and analysis of fumes and gases:

GB/T 43905 is a universal standard for the analysis of dust and gas generated by different process methods:

The basic method standard consists of six parts:

--- Part 1: Determination of smoke emission rate during arc welding and collection of smoke for analysis: The purpose is to specify the conditions applicable to welding that is prone to generate smoke:

Laboratory method for determination of welding fume emission rate from open arc welding of fumes and collection methods for analysis:

--- Part 2: Determination of emission rates of carbon monoxide, carbon dioxide, nitric oxide and nitrogen dioxide during arc welding, cutting and gouging:

The purpose is to specify the carbon monoxide, carbon dioxide, nitrogen monoxide, and carbon dioxide generated during arc welding, cutting, and gouging:

Laboratory method for determination of nitrogen emission rate:

--- Part 3: Determination of ozone emission rate during arc welding: The purpose is to specify the ozone emission rate applicable to automatic arc welding process Laboratory method for determination of emission rates:

--- Part 4: Limits of welding fume emissions from welding materials: The purpose is to specify the limits applicable to non-alloy steel, alloy steel and non-ferrous metals:

Method for compiling welding fume emission limits for all welding materials used for manual, semi-automatic or fully automatic arc welding connections or cladding:

--- Part 5: Identification of thermal degradation products of organic materials during welding or cutting based on pyrolysis-gas chromatography-mass spectrometry:

The regulations apply to coatings composed wholly or partly of organic materials that are subjected to thermal degradation during welding, cutting, preheating and straightening:

Laboratory method for identification and semi-quantitative measurement of the components of undefined products:

--- Part 6: Quantitative determination of smoke and gases in resistance spot welding: The purpose is to specify the application of the resistance spot welding of coated and uncoated steel sheets:

Laboratory method for determination of emission rates of fumes and gases generated by welding:

Welding and related processes generate fumes and gases which are harmful to human health if inhaled:

The information can help occupational health professionals assess worker exposure and determine appropriate control measures:

GB/T 43905.1 and GB/T 43905.2 are primarily used to generate emission rate data when welding uncoated metals:

It is a common phenomenon in the welding industry to weld or cut various coatings that are composed wholly or partly of organic materials: These coatings include shop primers, oils, Paints, oils, waxes, and inter-weld materials such as adhesives and sealants: When heated, these coatings can generate various thermal degradation the composition of the coating depends on the temperature to which the coating is subjected: During welding and cutting, the coating material the material is subjected to a range of temperatures:

The purpose of this document is to specify methods for identifying and semi-quantitatively determining the quality of metals during welding, cutting, preheating and straightening treated with the above-mentioned coatings:

The data generated are used to provide information on degradation:

If necessary, current standards for workplace exposure measurements can be used to assess the exposure of these substances in the test:

The identified degradants were quantitatively measured:

This document can be used by coating manufacturers to provide information for inclusion in safety data sheets and by occupational hygienists when carrying out risk assessments:

The data obtained cannot be used directly to evaluate the workplace exposure:

Touch degree:

Laboratory-based heating, pyrolysis and different welding techniques were used to compare various through-weld coatings:

The use of pyrolysis as the basis for the test procedures specified in this document is based on the following observations and conclusions:

---Pyrolysis successfully identified most of the components of important hygienic significance;

---Although the pyrolysis tests were carried out in a helium atmosphere, the results were very similar to those obtained by furnace pyrolysis in air:

resemblance;

--- The cost of pyrolysis test is significantly lower than that of welding test;

--- The results of the pyrolysis test have good inter-laboratory consistency;

--- Pyrolysis test is easier to determine standard conditions than welding test;

--- In order to reduce the sampling procedures required, any welding test procedure is likely to require some preliminary testing in the laboratory:

Pyrolysis may be used:

Sampling of fumes and gases during welding and related processes Laboratory methods
Part 5: Based on pyrolysis-gas phase Chromatography-mass spectrometry of organic materials in welding or cutting Identification of thermal degradation products

1 Scope

This document describes the identification and semi-quantification of thermal degradation products generated during welding, cutting, preheating and straightening of coated metals: