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Metallic materials - Determination of microporosity - Fluorescence method

金属材料 显微疏松的测定 荧光法

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Metallic materials - Determination of microporosity - Fluorescence method

1 Scope

This Standard specifies the sample preparation, microscope configuration, measurement, measurement accuracy, and test report, etc. for fluorescence method for the determination of area percentage content of microporosity in metallic materials.

This Standard applies to the determination of the area percentage content of microporosity in as-cast metallic materials and 3D printed metallic materials. The determination of the pore content in other materials such as ceramics, powder metallurgy materials may refer to it for use.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

GB/T 13298 Inspection methods of microstructure for metals

GB/T 15749-2008 Measuring method in quantitative metallography

GB/T 30067 Standard Terminology Relating to Metallography

3 Terms and definitions

The terms and definitions defined in GB/T 30067 and the following ones apply to this document. For ease of use, some of the terms and definitions in GB/T 30067 are repeated below.

3.1 Microporosity

Very fine pores in the casting.

requirements of the corresponding product standard or the agreement between the two parties. When not required, it shall measure at least 5 random view fields. It shall avoid the repeat overlay of the view fields and take the average result as the measured value. According to the product standard or the mutual agreement, it may also be expressed in terms of the area percentage content of the most serious view field.

6.2 Measurement methods

6.2.1 Quantitative metallographic manual measurement method

USE fluorescence imaging method of a metallographic microscope to collect microporosity photographs. According to the provisions of GB/T 15749-2008, manual testing methods such as grid counting pixels method or microscopic micrometer eyepiece determination method are used to quantitatively detect and calculate the area percentage content of microporosity in the sample.

6.2.2 Image analysis measurement method

6.2.2.1 In the image analysis software, open the image to be tested. If the software for collecting images and the image analysis software belong to the same software program, it is necessary to check the magnification times of the image; the analysis and measurement can be directly performed in the image analysis software. If the software for collecting images and the image analysis software are software from different manufacturers, the magnification times of the image shall be checked first; then the image quantitative analysis and calculation shall be performed.

6.2.2.2 LOAD the ruler.

6.2.2.3 The image is subjected to binary segmentation processing to extract the microporosity to be tested. The acquired image, whether it is a grayscale image or a color image, requires binary segmentation numerical processing on the object to be tested. EXTRACT the binary segmentation graph of the object to be tested and then calculate.

6.2.2.4 The function of measuring the percentage content of two-phase or multi-phase area in image analysis is selected, to measure the area percentage content of the extracted microporosity.

6.2.2.5 In case of dispute, the image analysis measurement method is used as the arbitration method.

8 Result representation

8.1 If the product technical standard or the agreement between the supplier and the purchaser requires to report the area percentage content of the microporosity of the most serious view field, then the microporosity content is expressed as a percentage. Retain one significant digit after the decimal point. The rules of rounding off shall be in accordance with GB/T 8170.

8.2 Unless otherwise specified, the measurement result of area percentage content of microporosity may be expressed by $\bar{S}$±95%CI (%RA).

9 Test report

The test report should include the following:

a) This Standard number;

b) Sample name, material, and specifications;

c) The ratio of fluorescent infiltrant, vacuum degree, infiltration time;

d) The area percentage content of microporosity;

e) Test report number and date.

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