

ICS 25.030
CCS H 71



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

GB/T 45676-2025

**Additive manufacturing - Determination of moisture content in
metal powder feedstock - Karl Fischer coulometric method**

增材制造 金属粉末含水量的测定 卡尔费休库伦法

Issued on: May 30, 2025

Implemented on: September 1, 2025

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

- Foreword
- 1 Scope
- 2 Normative references
- 3 Terms and definitions
- 4 Principle
- 5 Reagents
 - 5.1 Karl Fischer reagent

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.

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document was proposed by the China Machinery Industry Federation.

This document is under the jurisdiction of the National Additive Manufacturing Standardization Technical Committee (SAC/TC562).

This document was drafted by: Wuxi Inspection and Certification Research Institute, Tongling University, Damo Tianyu Co., Ltd., Core Element (Hangzhou) Technology Development Co., Ltd.

Development Co., Ltd., Nanjing Institute of Environmental Sciences of the Ministry of Ecology and Environment, Saifuli Chemical Handan Co., Ltd., Swiss Metrohm China Co., Ltd., AVIC Matt Additive Technology (Beijing) Co., Ltd., Dongguan Huanli Intelligent Technology Co., Ltd., China Machinery Research Institute of Standards and Technology (Beijing) Co., Ltd.

Co., Ltd., Ningbo Shangcai 3D Technology Co., Ltd., Tianjin Binhai Rex Laser Technology Development Co., Ltd., and Nanjing Normal University.

The main drafters of this document are: Chen Zuowang, Wang Dongsheng, Zhou Qichao, Zhou Nanjia, Zhou Hao, Lan Tian, Liu Luan, Liu Binhua, Ma Teng, Hong Zhihui, Weng Zhaonan, Hu Juan, Pu Feng, Wang Shaobo, Tang Wenlai.

Determination of Moisture Content in Metal Powders for Additive Manufacturing Karl

Fischer Coulomb method

1 Scope

This document describes the principle of the Karl Fischer Coulometry method for the determination of water content in metal powders for additive manufacturing and specifies the reagents, instruments, and measuring methods.

Test sample sampling, test procedures and test reports.

This document is applicable to the determination of free water content of metal powders for additive manufacturing, ranging from 0.0015% to 5% (mass fraction).

The determination of free water content in non-metallic powders such as polymer materials and ceramic materials used in additive manufacturing shall be carried out as a reference.

2 Normative references

GB/T 6682

GB/T 35351

3 Terms and definitions

The terms and definitions defined in GB/T 35351 apply to this document.

4 Principle

The free water in the sample is heated and vaporized in a Karl Fischer furnace and blown into the anode liquid of the Karl Fischer reagent with nitrogen as a carrier.

The iodine ion (I^-) begins to electrolyze to produce iodine (I_2). Iodine (I_2) reacts quantitatively with water. The water content is calculated based on the amount of electricity consumed by the electrolysis.

The reaction equations are shown in equations (1) to (3). There is a potential difference between the two electrodes immersed in the solution. When water exists in the solution, the cathode polarization resists the flow of current.

The end point of the reaction is determined by cathodic depolarization accompanied by a sudden increase in current. Reaction. $2I^- - 2e^- \rightarrow I_2$ (1) $H_2O + I_2 + SO_2 + 3C_5H_5N \rightarrow 2C_5H_5N \cdot HI + C_5H_5NSO_3$ (2) $C_5H_5N \cdot SO_3 + ROH \rightarrow C_5H_5NHOSO_2OR$ (3)

5.1 Karl Fischer reagent

Anolyte. Analytical grade or higher.

Cathodic solution. analytical grade or higher.