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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 12690.5-2017

Replacing GB/T 12690.5-2003

Chemical analysis methods for non-rare earth impurities in rare earth metals and their oxides - Part 5: Determination of cobalt, manganese, lead, nickel, copper, zinc, aluminium, chromium, magnesium, cadmium, vanadium and iron

稀土金属及其氧化物中非稀土杂质化学分析方法 第5部分：钴、锰、铅、镍、铜、锌、铝、铬、镁、镉、钒、铁量的测定

Issued on: October 14, 2017 **Implemented on: February 1, 2018**

Issued by: General Administration of Quality Supervision, Inspection and Quarantine;
Standardization Administration of the PRC

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Foreword

GB/T 12690 "rare earth metals and oxides non-rare earth impurities chemical analysis method" is divided into 18 parts.

--- Part 1. Determination of carbon, sulfur content High-frequency - infrared absorption method;

--- Part 2. Determination of ignition loss in rare earth oxides gravimetric method;

--- Part 3. Determination of water content in rare earth oxides gravimetric method;

--- Part 4. Determination of oxygen and nitrogen content Pulsed - infrared absorption and pulse - thermal conductivity method;

--- Part 5. Determination of cobalt, manganese, lead, nickel, copper, zinc, aluminum, chromium, magnesium, cadmium, vanadium and iron content;

--- Part 6. Determination of iron content potassium thiocyanate, 1,10-phenanthroline spectrophotometry;

--- Part 7. Determination of silicon content molybdenum blue spectrophotometry;

--- Part 8. Determination of sodium content; Flame atomic absorption spectrometry;

--- Part 9. Determination of chlorine content silver nitrate turbidimetric method;

--- Part 10. Determination of phosphorus content molybdenum blue spectrophotometry;

--- Part 11. Determination of magnesium content by flame atomic absorption spectrometry;

--- Part 12. Determination of thorium content;

--- Part 13. Determination of molybdenum and tungsten content;

1 Scope

Part 5 of China's series on the chemical analysis of non-rare-earth impurities in rare earth metals and oxides, and the workhorse of the series: the simultaneous determination of

twelve common metallic impurities - cobalt, manganese, lead, nickel, copper, zinc, aluminium, chromium, magnesium, cadmium, vanadium and iron. These are the elements that arrive from the ore, from the reagents, from the vessels and from the handling, and they are what a purchaser reads first on a certificate of analysis, because they are the ones that affect what the material can be used for. In a phosphor, a transition metal at parts per million quenches the luminescence. In a magnet alloy, iron and the other transition elements change the magnetic properties. In an optical or a catalytic application they poison the function directly. Determining twelve elements in one procedure rather than twelve is not merely convenient: it means one dissolution, one matrix correction and one calibration, and therefore one consistent set of conditions for figures that will be read together. The difficulty is again the matrix, which is almost entirely rare earth: the analyte elements are present at trace level in a solution dominated by elements that emit and absorb strongly themselves. Most of the procedure is about that - the dissolution, the way the matrix is matched in the calibration solutions, the choice of the analytical lines or masses that are least interfered with, and the internal standard. The standard sets the reagents, the apparatus, the procedure, the calculation and the precision for each of the twelve. Issued on 14 October 2017 and in force since 1 February 2018, it replaces GB/T 12690.5-2003.

1 Oxide measurement range (mass fraction) /% Oxide measurement range (mass fraction) /% Cobalt oxide 0.0010 to

0.10 Alumina 0.0010 to

0.10 Manganese oxide 0.0010 to

0.10 Chromium oxide 0.0010 to

0.10 Lead oxide 0.0010 to

0.10 Magnesium oxide 0.0002 to

0.10 Nickel oxide 0.0010 to

0.10 Cadmium oxide 0.0010 to

0.10 Copper oxide 0.0010 to

0.10 Vanadium oxide 0.0010 to

0.10 Zinc oxide 0.0010 to

0.10 Iron oxide 0.0010 to

0.50 Table

2 Oxide measurement range (mass fraction) /% Oxide measurement range (mass fraction) /% Cobalt oxide 0.0001 to

2 Methods 1. Inductively coupled plasma atomic emission spectrometry

2.1 method principle The sample was dissolved in nitric acid, excited in a dilute nitric acid medium by an argon plasma light source, and subjected to spectrometry.