

ISO/TS 25138:2025-02 (E)

Surface chemical analysis - Analysis of metal oxide films by glow discharge optical emission spectrometry

Contents		Page
Foreword		v
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Principle	1
5	Apparatus	2
5.1	Glow discharge optical emission spectrometer	2
5.1.1	General	2
5.1.2	Selection of spectral lines	2
5.1.3	Selection of glow discharge source type	2
6	Adjusting the glow discharge spectrometer system settings	3
6.1	General	3
6.2	Setting the parameters of a DC source	4
6.2.1	Constant applied current and voltage	4
6.2.2	Constant applied current and pressure	5
6.2.3	Constant voltage and pressure	5
6.3	Setting the discharge parameters of an RF source	6
6.3.1	General	6
6.3.2	Constant applied voltage and pressure	6
6.3.3	Constant applied power and DC bias voltage	7
6.3.4	Constant effective power and RF voltage	7
6.4	Minimum performance requirements	7
6.4.1	General	7
6.4.2	Minimum repeatability	8
6.4.3	Detection limit	8
6.4.4	Control of lamp cleanliness and start-up performance	9
7	Sampling	11
8	Calibration	11
8.1	General	11
8.2	Calibration samples	11
8.2.1	General	11
8.2.2	Low alloy iron or steel samples	12
8.2.3	Stainless-steel samples	12
8.2.4	Nickel alloy samples	12
8.2.5	Copper alloy samples	12
8.2.6	Titanium alloy samples	12
8.2.7	Silicon samples	12
8.2.8	Aluminium alloy samples	12
8.2.9	High-oxygen samples	12
8.2.10	High-carbon samples	12
8.2.11	High-nitrogen samples	12
8.2.12	High-hydrogen samples	13
8.2.13	High-purity copper samples	13

8.3	Validation samples	13
8.3.1	General	13
8.3.2	Hot-rolled low-alloy steel	13
8.3.3	Oxidized silicon wafers	13
8.3.4	TiN-coated samples	13
8.3.5	Anodized Al ₂ O ₃ samples	13
8.3.6	TiO ₂ -coated samples	13
8.4	Determination of the sputtering rate of calibration and validation samples	13
8.5	Emission intensity measurements of calibration samples	15
8.6	Calculation of calibration formulae	15
8.7	Validation of the calibration	15
8.7.1	General	15
8.7.2	Checking analytical accuracy using bulk reference materials	16
8.7.3	Checking analytical accuracy using metal oxide reference materials	16
8.8	Verification and drift correction	16
9	Analysis of test samples	17
9.1	Adjusting discharge parameters	17
9.2	Setting of measuring time and data acquisition rate	17
9.3	Quantifying depth profiles of test samples	17
10	Expression of results	18
10.1	Expression of quantitative depth profile	18
10.2	Determination of metal oxide mass per unit area	18
10.3	Determination of the average mass fractions of the elements in the oxide	19
11	Precision	19
12	Test report	19
Annex A (informative)	Calculation of calibration constants and quantitative evaluation of depth profiles	20
Annex B (informative)	Suggested spectral lines for determination of given elements	31
Annex C (informative)	Examples of oxide density and the corresponding quantity O	33
Annex D (informative)	Report on interlaboratory testing of metal oxide films	34
Bibliography	39