

Chemical Analysis of Barite

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Contents

	Page
1 Scope.....	1
2 Normative References.....	2
3 Terms, Definitions, Acronyms, Abbreviations, and Symbols.....	2
3.1 Terms and Definitions.....	2
3.2 Acronyms and Abbreviations.....	2
3.3 Symbols.....	3
4 Wet Analysis Methods.....	6
4.1 Principle.....	6
4.2 Advantages of Wet Chemical Analysis Methods.....	6
4.3 Summary of General Analytical Methods.....	6
5 Barium Sulfate and Strontium Sulfate.....	7
5.1 Principle.....	7
5.2 Reagents and Materials.....	8
5.3 Apparatus.....	8
5.4 Sampling.....	9
5.5 Procedure—Barium Sulfate Determination.....	9
5.6 Procedure—Strontium Sulfate Determination.....	11
5.7 Calculation—Barium Sulfate and Strontium Sulfate Mass Fractions.....	11
6 Silica and Alumina.....	12
6.1 Principle.....	12
6.2 Reagents and Materials.....	12
6.3 Apparatus.....	13
6.4 Procedure—Sample Preparation.....	14
6.5 Procedure—Silica Determination.....	15
6.6 Procedure—Alumina Determination.....	15
6.7 Calculation—Silica and Alumina Mass Fractions.....	16
7 Hydrochloric Acid Soluble Metals—Sodium, Potassium, Calcium, Magnesium, Iron, Copper, Manganese, Lead, and Zinc.....	17
7.1 Principle.....	17
7.2 Reagents and Materials.....	17
7.3 Apparatus.....	17
7.4 Procedure.....	18
7.5 Calculation.....	18
8 Procedure—Hydrofluoric, Sulfuric, Nitric, Perchloric Acid Soluble Metals—Sodium, Potassium, Calcium, Magnesium, Iron, Copper, Manganese, Lead, and Zinc.....	18
8.1 Principle.....	18
8.2 Reagents and Materials.....	19
8.3 Apparatus.....	19
8.4 Procedure.....	20
8.5 Calculation.....	21
9 Alternative Methods for Iron.....	21
9.1 Principle.....	21
9.2 Reagents and Materials.....	21

Contents

	Page
9.3	Apparatus 22
9.4	Nitric Acid Digestion—Iron 23
9.5	Aqua Regia Digestion—Iron 23
9.6	Procedure—Carbonate Fusion 24
10	Water-soluble Materials in Barite 25
10.1	Principle 25
10.2	Apparatus and Materials 25
10.3	Procedure—Water-soluble Materials in Barite 26
10.4	Water-soluble Metals in Barite 27
10.5	Calculation—Water-soluble Materials in Barite 27
11	Water-soluble Chlorides 27
11.1	Principle 27
11.2	Reagents and Materials 27
11.3	Apparatus 28
11.4	Procedure—Water-soluble Chlorides by Titration 28
11.5	Procedure—Water-soluble Chlorides by Ion Chromatography 28
11.6	Calculation—Water-soluble Chlorides 29
12	Water-soluble Sulfates 29
12.1	Principle 29
12.2	Reagents and Materials 29
12.3	Apparatus 30
12.4	Procedure—Preparation of Calibration Chart for Turbidity Method 30
12.5	Procedure—Analysis for Water-soluble Sulfates by Turbidity Method 31
12.6	Procedure—Analysis for Water-soluble Sulfate by Ion Chromatography 31
12.7	Calculation—Water-soluble Sulfates 31
13	Water-soluble Carbonates, Bicarbonates, and Hydroxyl Ions 32
13.1	Principle 32
13.2	Reagents and Materials 32
13.3	Apparatus 32
13.4	Procedure 32
13.5	Calculation 33
14	Water-soluble Phosphates 34
14.1	Principle 34
14.2	Reagents and Materials 34
14.3	Apparatus 35
14.4	Procedure—Preparation of Calibration Curve 35
14.5	Procedure—Analysis of Sample 36
14.6	Calculation 36
15	Loss on Ignition (LOI) 36
15.1	Principle 36
15.2	Reagents, Materials, and Apparatus 37
15.3	Procedure 37
15.4	Calculation 37
16	Siderite Content 38

Contents

	Page
16.1 Principle	38
16.2 Reagents and Materials	38
16.3 Apparatus	38
16.4 Procedure—EDTA Extraction.....	39
16.5 Procedure—Iron Content by AA or ICP Spectrometry	39
16.6 Procedure—Iron Content by Colorimetric Determination	39
16.7 Calculation—Siderite by EDTA Extraction and AA/ICP.....	40
17 Zinc Carbonate and Lead Carbonate	40
17.1 Principle	40
17.2 Reagents, Materials, and Apparatus.....	41
17.3 Procedure—Acetic Acid Extraction	41
17.4 Procedure—Lead and Zinc Determination by AA or ICP Spectrometry.....	41
17.5 Calculations	42
18 Total Carbonate	42
18.1 Principle	42
18.2 Reagents and Materials	42
18.3 Apparatus	42
18.4 Procedure	44
18.5 Calculation	45
19 Acid-soluble Sulfides	45
19.1 Principle	45
19.2 Reagents and Materials	45
19.3 Apparatus	46
19.4 Procedure	46
19.5 Calculation	47
20 Calcium Hydroxide (Lime) or Cement	48
20.1 Principle	48
20.2 Reagents and Materials	48
20.3 Apparatus	48
20.4 Procedure	48
20.5 Calculation	49
21 X-ray Fluorescence Analysis	49
21.1 Principle	49
21.2 Reagents and Materials	50
21.3 Apparatus	50
21.4 XRF Analysis—Procedures	51
21.5 Procedure—Spectral Analysis	53
21.6 Calculation	54
22 Mercury in Drilling Fluid Barite	54
22.1 Principle	54
22.2 Reagents and Materials	54
22.3 Apparatus	56
22.4 Preparation of Standards.....	56
22.5 Sample Digestion.....	57
22.6 Recovery of Hg during Digestion—Check	57

Contents

	Page
22.7 Standards and Samples—Analysis	57
22.8 Calculation	58
23 Cadmium and Lead in Drilling Fluid Barite	59
23.1 Principle	59
23.2 Reagents and Apparatus	59
23.3 Preparation of Combined Cadmium and Lead Standards	60
23.4 Sample Acid Digestion	60
23.5 Analysis of Standards and Samples	61
23.6 Calculation	61
24 Arsenic in Barite.....	62
24.1 Principle	62
24.2 Reagents and Apparatus	62
24.3 Preparation of As Standards.....	64
24.4 Sample Digestion.....	64
24.5 Analysis of Standards and Samples	64
24.6 Calculation	65
Annex A (informative) Rational Analysis	66
Bibliography.....	69
Figures	
1 Typical Correction Curve for SrSO in BaSO.....	12
Tables	
1 Minerals Associated with Barite Ore Bodies	1
2 H ₂ S Dräger Tube Identification, Sample Volume, and Tube Factor to be Used for Various Sulfide Ranges	47

Chemical Analysis of Barite

1 Scope

1.1 Barite is used to increase the density of oil well drilling fluids. It is a mined product that can contain significant quantities of minerals other than barium sulfate, which is its main component.

1.2 A list of some minerals commonly associated with barite ores is given in Table 1 with the chemical formulas, mineralogical names, and the densities of the mineral grains.

1.3 The performance of barite in a drilling fluid is related in part to the percentage and type of non-barite minerals distributed in the barite ore. Some of these minerals have little or no effect on drilling fluid properties, but others can degrade these properties and even be harmful to rig personnel.

1.4 It is the objective of this publication to provide a comprehensive, detailed description of the chemical analytical procedures for quantitatively determining the mineral and chemical constituents of barite. These procedures are quite elaborate and will normally be performed in a well-equipped laboratory.

Table 1—Minerals Associated with Barite Ore Bodies

Mineral	Chemical Formula	Mineralogical Name	Relative Density	Hardness Mohs
Barium sulfate	BaSO ₄	Barite, baritocite, barytes	4.50	2.5–3.5
Strontium sulfate	SrSO ₄	Celestite	3.97	3.5
Barium carbonate	BaCO ₃	Witherite	4.30	3.5
Barium silicate	BaSi ₂ O ₅	Sarcophagite	3.74	5
Calcium carbonate	CaCO ₃	Calcite	2.72	3
Calcium magnesium carbonate	CaMg(CO ₃) ₂	Dolomite	2.87	3.5–4
Magnesium carbonate	MgCO ₃	Magnesite	3.0	4
Calcium sulfate	CaSO ₄ •2H ₂ O	Gypsum	2.3	2
Calcium fluoride	CaF ₂	Fluorite	3.0	4
Iron (ferric) oxide	Fe ₂ O ₃	Hematite	5.2	5.5
Iron oxyhydroxide	Fe ₂ O ₃ •nH ₂ O	Goethite	3.3–4.0	5–5.5
Iron (II, III) oxide	Fe ₃ O ₄	Magnetite	5.16–5.17	5.5–6.5
Iron carbonate	FeCO ₃	Siderite	3.7–3.9	3.5–4
Iron sulfide	FeS ₂	Pyrite	5.0	6–6.5
Iron sulfide	Fe _{1-x} S _x (x=0 to 0.2)	Pyrrhotite	4.6	4
Iron/copper sulfide	CuFeS ₂	Chalcopyrite	4.2	4
Lead sulfide	PbS	Galena	7.5	2.5
Zinc sulfide	ZnS	Sphalerite	3.9	3.5–4
Ferrous titanate	FeTiO ₃	Ilmenite	4.7	5.5
Silicon dioxide	SiO ₂	Quartz, sand, chert	2.65	7
Aluminosilicates:				
Feldspar	(Na,K)AlSi ₃ O ₈	Albite, microcline	2.6	6
Mica	KAl ₂ (OH) ₂ AlSi ₃ O ₁₀	Muscovite	2.85	2.5
Clays	Al ₂ Si ₂ O ₅ (OH) ₄	Kaolinite	2.6	2
	(Al,Mg)(OH) ₂ Si ₄ O ₁₀ (Na,Ca) _x •4H ₂ O	Montmorillonite	2–3	1–2