Quality control for geological sample analysis

Hubei Geological Research Laboratory Caihua Xiong

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01

Classification of geological samples

01 Classification of geological samples

According to the characteristics of geological samples

Rock, sediment, soil, ore, water (groundwater, surface water, mineral water, sea water, irrigating water, engineering water), coal, petroleum, organisms, atmospheric bulk deposition

For different kind of samples, required sample preparation, digestion and analysis method with different quality control method are different.

According to the purpose Of geological work

Geochemistry investigation samples, regional geological investigation samples, mineral and geology exploration samples, Hydrogeology, engineering Geology and environmental geology samples, petroleum geological samples

For different analysis objects, different analysis elements and contents, required analysis error is different.

02

Test quality control method of geological samples

Quality control during sample preparation

Preparation of pollution-free samples

Bulk rock samples

Coarse crushing with jaw crusher lined with corundum

Fine Crushing preparation of rock, soil and sediment

Agate planetary ball mill or grinding miller

Preparation of pollution-free samples

Bulk Quartz rock samples

Preparation after high temperature combustion and water quenching

Crushing preparation of ore samples

With special sample preparation equipment in case of cross contamination

Minimum sample size and representativeness

During the preparation of representative samples, it is necessary to crush and divide samples many times. The dividing follows Qeqott formula:

$$Q = Kd^2$$

Q—Minimum reliable quality of the sample，kg
d—Maximum particle diameter of the sample，mm
K—dividing coefficient determined according to the characteristics of rock and ore samples

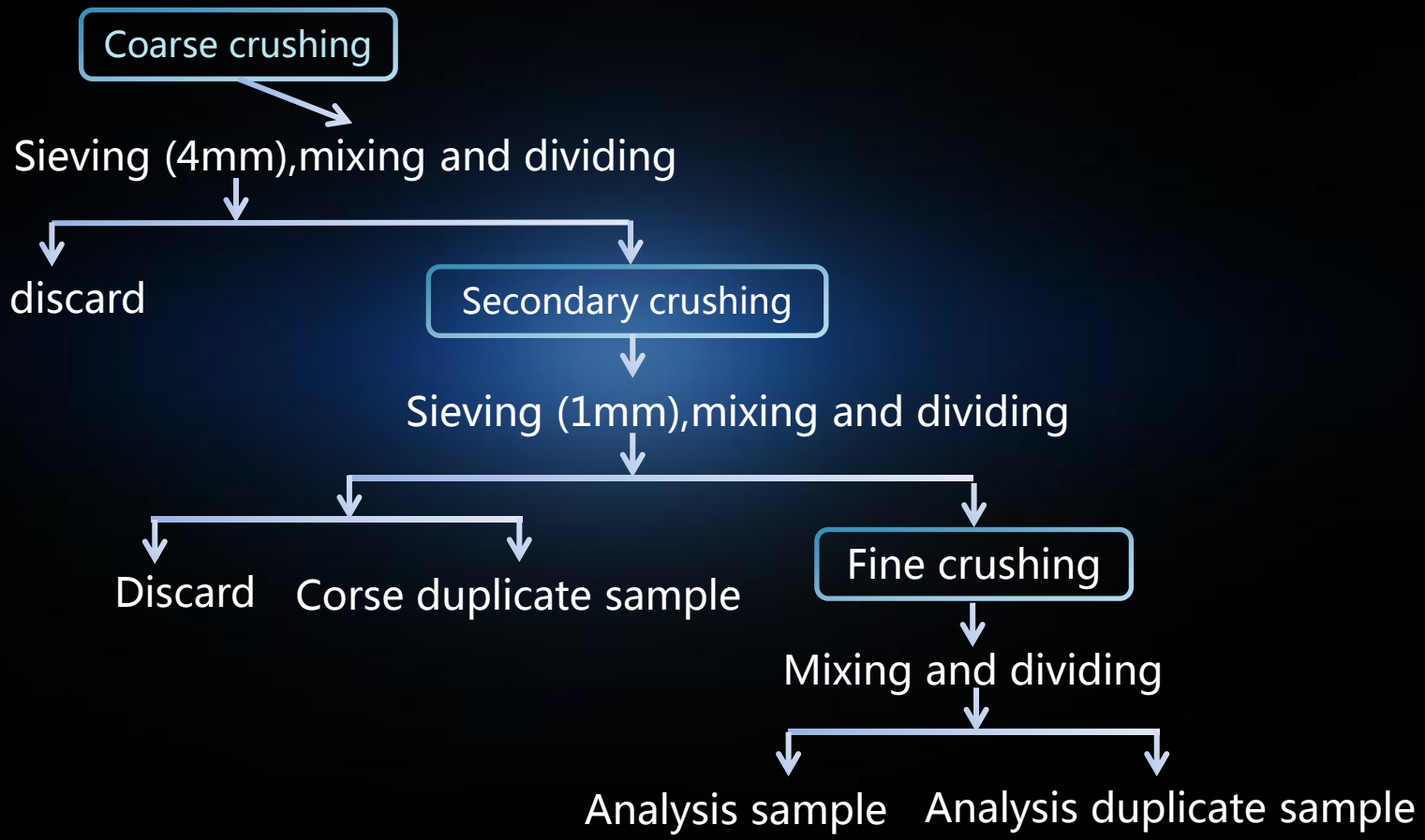
◆ Minimum sample size and representativeness

Classification of rock and mineral	K
Fe, Mn (Contact metasomatism 、deposition、metamorphism)	0.1 ~ 0.2
Cu, Mo, W	0.1 ~ 0.5
Ni, Co (sulfide)	0.2 ~ 0.5
Ni(silicate), monohydrallite (uniform)	0.1~0.3
monohydrallite (non-uniform, such as pyritization monohydrallite, calcareous alumine breccia et al.)	0.3 ~ 0.5
Cr	0.3
Pb, Zn, Sn	0.2
Sb, Hg	0.1 ~ 0.2
magnesite, limestone, dolomite	0.05 ~ 0.1
Nb, Ta, Zr, Hf, Li, Rb, Cs, Sc and rare earth element	0.1 ~ 0.5
P, S, quartzite, kaoline, clay, silicate, fluorspar, talcum, ophiolite, graphite , Salt alumstone, feldspar, gypsum, arsenic, boron rock	0.1 ~ 0.2 0.02
barite(fluorite barite, sulfide barite, iron barite, clay barite)	0.2 ~ 0.5

Note1 : For samples of gold and platinum family, the standard of "Preparation of samples of gold and platinum family " is adopted.
Note 2: Rock and mineral unlisted in the table, K=0.2 is adopted without expriment.

Dividing coefficient of main rock and mineral (K)

Preparation of common rock and mineral samples



Preparation scheme of common rock and mineral samples

02 Test quality control method of geological samples

Quality control during sample preparation

Drying temperature and analysis particle size requirement of various rock and mineral samples

Classification of various rock and mineral samples	Particle size after crushing/mm	Drying temperature/℃	note
Silicate, such as granite	0.097~0.074	105	
Limestone, dolomite, and alunite	0.097	105	
Quartzite	0.074	105	
Kaolin, clay	0.097~0.074	Samples without drying, water content corrected	
Apatite	0.125	105~110	GB/T 1868-1995
Pyrite	0.149	100~105℃ or samples without drying, water content corrected	GB/T 2460-1996
Boron rock	0.097	60	
Gypsum	0.125	55	
Mirabilite	0.250~0.177	Samples without drying, water content corrected	
Iron ore	0.097~0.074	105~110	GB/T 1361-1978
Manganese ore	0.097	Samples without drying, water content corrected	
Chromite, ilmenite	0.074	105	
Copper ore, lead zinc ore	0.097	60~80	
Monohydrallite	0.097~0.074	105	
Tungsten ore, tin ore	0.097~0.074	105	
Bismuth ore, antimony ore, molybdenum ore andarsenic ore	0.097	60~80	
Nickel ore， navajoite and cobalt ore	0.097	105	
Mercury ore	0.149	Samples without drying,	
Gold, silver and platinum family	0.074	60~80 (Samples of Au and Pt family without drying)	
Uranium ore	0.097~0.074	105	
Kerogen shale	0.250~0.177	Samples without drying	
Geochemistry sample	0.097-0.074	60a	
Phase analysis, ferrous measure	0.149	Samples without drying	
Rare element ore	0.097	105	
Rutile	0.097	105	
Serpentinite, steatite and pyrophyllite	0.097	105	
Celestite, barite and fluorite	0.097	105	
Rock salt sample	0.149	Samples without drying, water content corrected	
Monomineral sample	0.074	105	
Macker	0.097	105	
Batt	0.125	105	

a: exceeding this temperature is not permitted.

Quality control during sample preparation

◆ Quality Test of samples preparation

▲ Requirement of scrap rate:

$$\text{scrap rate} = \frac{\text{weight of orginal sample or final dividing reserved sample(g)} - \text{weight of crushed samples}}{\text{weight or orginal sample or final dividing reserved sample(g)}} \times 100$$

▲ Requirement of samples mass difference during preparation:

$$\text{dividing mass difference} = \frac{\text{weight of reserved sample(g)} - \text{weight of discarded sample}}{\text{weight of sample before being divided (g)}} \times 100$$

▲ Internal quality examination of samples preparation and quality sieving examination of samples:

$$\text{sieving rate (\%)} = \frac{\text{weight of sample seived from specified sieve number}}{\text{total weight of sample before being seived (g)}} \times 100$$

Determination of analysis method

Principles:

01 To meet client requirement

02 To meet the requirement of relevant laws and regulations, standards or norms

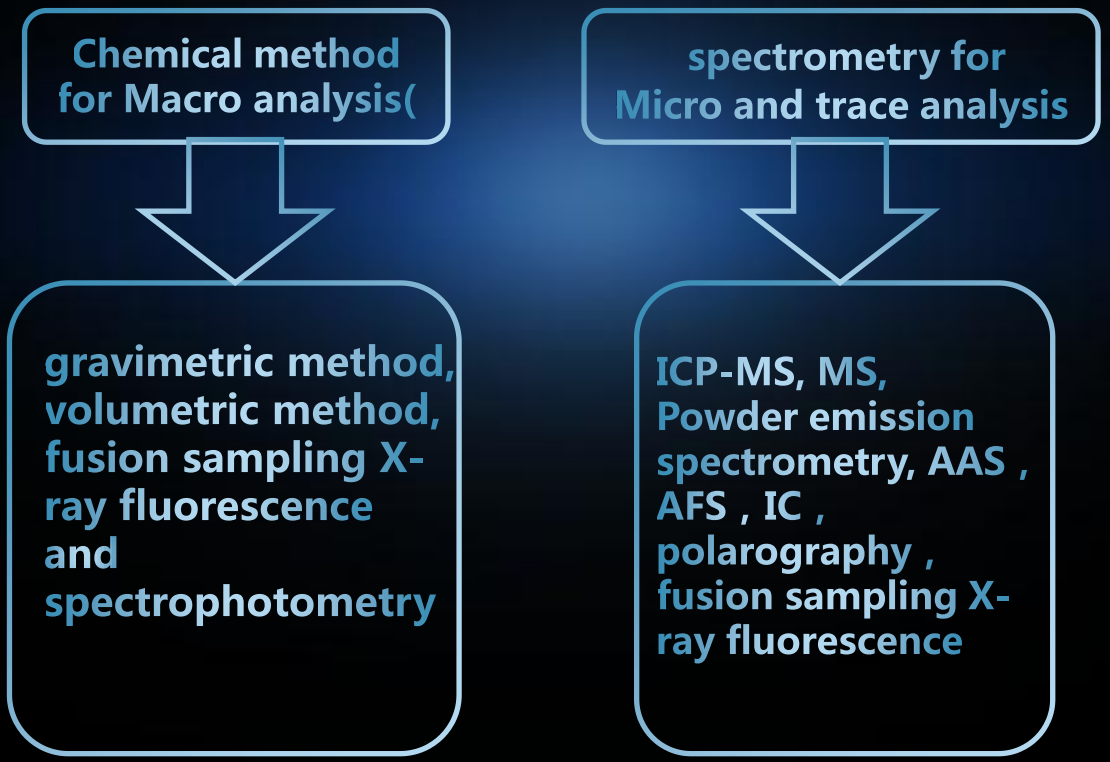
03 Detection limit, degree of accuracy and degree of precision are suitable for geological samples

04 Staff, equipment capacity and environmental condition

05 Safe, cost and without delay

◆ Determination of analysis method

▲ According to components to be measured and analysis purpose



02 Test quality control method of geological samples

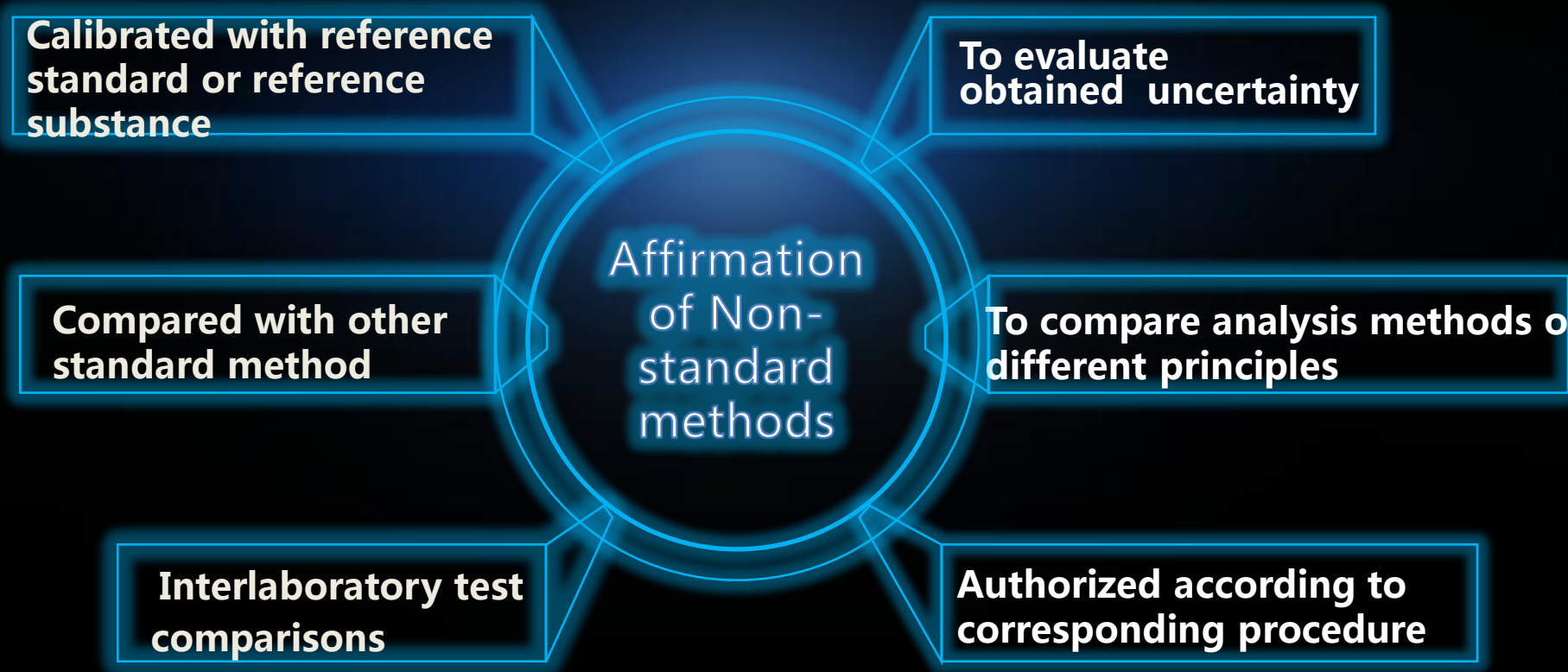
Determination of analysis method

Determination of standard method

02 Test quality control method of geological samples

◆ Determination of analysis method

▲Non-standard methods should be affirmed with the methods below.



02 Test quality control method of geological samples

◆ Monitoring with reference substance or control samples

1-2 and 2-3 reference substance control samples should be included with analysis samples less than 10 and more than 10 respectively in a batch. Monitoring samples could be added for special samples or samples with high requirements. For regional geological investigation, different control samples should be chosen.

▲Methods added for standard substance: distributed randomly or evenly in the location of samples in a batch .

◈ Monitoring with reference substance or control samples

▲Accuracy control: single test result of reference substance should be in the permission limit.

▲ Accuracy control index for rock and mineral analysis

Relative error permission limit of standard substance(or some certain component) (Y_B) is:

$$Y_B = \frac{1}{\sqrt{2}} Y_C = \frac{1}{\sqrt{2}} C \times (14.37X_0^{-0.1263} - 7.659)$$

Y_c——relative error permission limit of some certain component of duplicate sample，% ;
X_0 ——standard value of standard substance (of some certain component);
C——relative error permission limit coefficient of component duplicate sample of some mineral

02 Test quality control method of geological samples

◆ Recovery experiment of added standard reference

▲ Accuracy control index of recovery of added standard reference during rock and mineral analysis

permission limit of recovery

Component content	10^{-6}-10^{-4}	>10^{-4}
Adding standard recovery (%)	90∽110	95-105

02 Test quality control method of geological samples

Duplicate samples test

Number of analysis duplicate samples should be based on general requirement of clients or relative standards.
For rock and mineral analysis:

01 Analysis duplicate samples is 20~30% of total samples in each batch with random sampling method.

02 Analysis duplicate samples is 100% when analysis samples of each batch is less than 5.

03 Random sampling duplicates is 5~10% of total samples in each batch for semi-quantitative spectrometric analysis

04 Random sampling duplicates increases for special samples or samples with high requirement until reaches 100%

02 Test quality control method of geological samples

◆ Duplicate samples test

▲Relative duplicates error permission limit of rock and mineral samples

Mathematic model of relative duplicates error permission limit

$$Y_C = C \times (14.37 X_{ave}^{-0.1263} - 7.659)$$

Y_c——Relative duplicates error permission limit of some certain component，100%；
$X_{平}$——average mass fraction of the component，%；
C ——Relative duplicates error permission limit coefficient of some certain component (see DZ/T 0130.3-20)

02 Test quality control method of geological samples

Duplicate samples test

Mathematic model of relative duplicates error permission limit for precious metal component:

$$Y_G = 14.43 C X_{G\,ave}^{-0.3012}$$

where：

- Y_G—Relative duplicates error permission limit of some certain component for precious metal mineral，%；
- X_G——**Duplicate samples mass fraction of some certain component some time for precious metal mineral ，** 10^{-6}**;**
- **C—D**uplicates error permission limit coefficient for **precious metal mineral , see appendix A in** DZT 0130.3.

Application scope of the mathematic model：

- **For Au, 0.2～100) X10^{-6}; More than 10X$10^{-6,}$ 4.33% executed; less than 0.2X10^{-6}, 33.4 executed.**
- **For Ag, 5～100) X10^{-6}; more than 10X10^{-6},7.21% executed; less than 5 X10^{-6}, 33.4% executed.**
- **For Pt, Pd, Os, Ir, Rh and Ru, (0.2 ～5) X10^{-6}; more than 5X10^{-6}, 12.4% executed; less tan 0.2 X 10^{-6}, 33.4% executed.**

02 Test quality control method of geological samples

◆ Duplicate samples test

▲Relative duplicates error permission limit of rock and mineral samples

01 C=1, calculation of permission limit (YC), see appendix C in DZ/T130.3-2006

02 When Y_c calculated more than 30%, 30% executed.

03 When content of main mineral elements is less than cutoff grade, error is not considered. If the clients have special requirement, determined based on consultation each other.

04 Permission limit coefficient of trace non-ferrous metals, rare and scattered elements is 1. Less than 5×10^{-6}, 5×10^{-6} executed.

05 Permission limit for semi-quantitative spectrometric analysis is or less than 30%.

06 For phase analysis except iron, permission limit can adopt 50%

02 Test quality control method of geological samples

◆ Duplicate samples test

▲With repeatability limit(r) or reproducibility limit (R) of standard method as determining criteria of duplicate analysis.

With repeatability limit(r) or reproducibility limit (R) of standard method as permission limit of precision degree (Y_{cr} or Y_{CR}) ; Absolute value of repeatability limit(r) or reproducibility limit is less than or equals precision degree (Y_{cr} or Y_{CR}), qualified; otherwise unqualified.

02 Test quality control method of geological samples

Interlaboratory test comparison and proficiency testing

Interlaboratory test comparison results is based on GB/T 15483 with reproducibility limit of interlaboratory proficiency testing or other corresponding methods as control indicator.

Different results relevance of analysis samples

▲Relevance of various components of different mineral

For different geological samples, content of various elements or components should be in some certain range correlatively, or in reasonable proportion, which can be used as a method for test quality examination.

02 Test quality control method of geological samples

◆ Relevance of various components of analysis samples

▲ Content sum test

For various components of rock, ore and mineral, except for relative error permission limit of duplicate analysis for total analysis, percentage sum of main components results can be checked in two steps as follow:

- ◆ Step 1 : 99. 3%∽100. 7%
- ◆ Step 2 : 99.0%∽101.0%

Percentage sum and check steps should be determined based on sample characteristics and client requirement.

- ➢ Note1: In general, step 2 should be adopted.
- ➢ Note 2: If unreasonable sum components exist, sum should be executed after reasonable calculation.

For soil speciation analysis, sum test could be adopted.

02 Test quality control method of geological samples

Other effective test methods

01 Blank experiment: at least 2 blank samples should be analyzed with samples simultaneously for each batch of geological samples test. If necessary, rectified.

02 Test results could be monitored with statistics method to find and prevent the generation of system error.

03 Statistic analysis should be carried out for standard substance or monitoring samples added in the batch to produce real time monitoring diagram.

04 Content distribution statistics should be carried out for batch sample analysis results to find abnormal value.

05 Three-level laboratory quality review with particular emphasis.

03

Classification and usage of standard substances

03 Classification and usage of standard substances

01

Geochemistry materials

rock (granite, basalt, andesite, shale, quartzite, limestone, ultra-basic rock) ; soil (various soil in China, soil effective state component, soil speciation component) ; sediment (stream sediment, lake sediment, seabed sediment, coast and shoal sediment) ; biological sample (rice, wheat, maize, soybean, Chinese cabbage, garlic, spinach, tea, apple, chicken, prawn, pork liver, scallop, milk powder, citrus, green bean, carrot, celery, green Chinese onion, nori, pollen, spirulina)

02

Metallic ores

nonferrous metals ore, ferrous metal mineral, rare resources, rare earth and rarely scattered resources, precious metal ores, including raw ore, ore concentrate, tailings, slag.

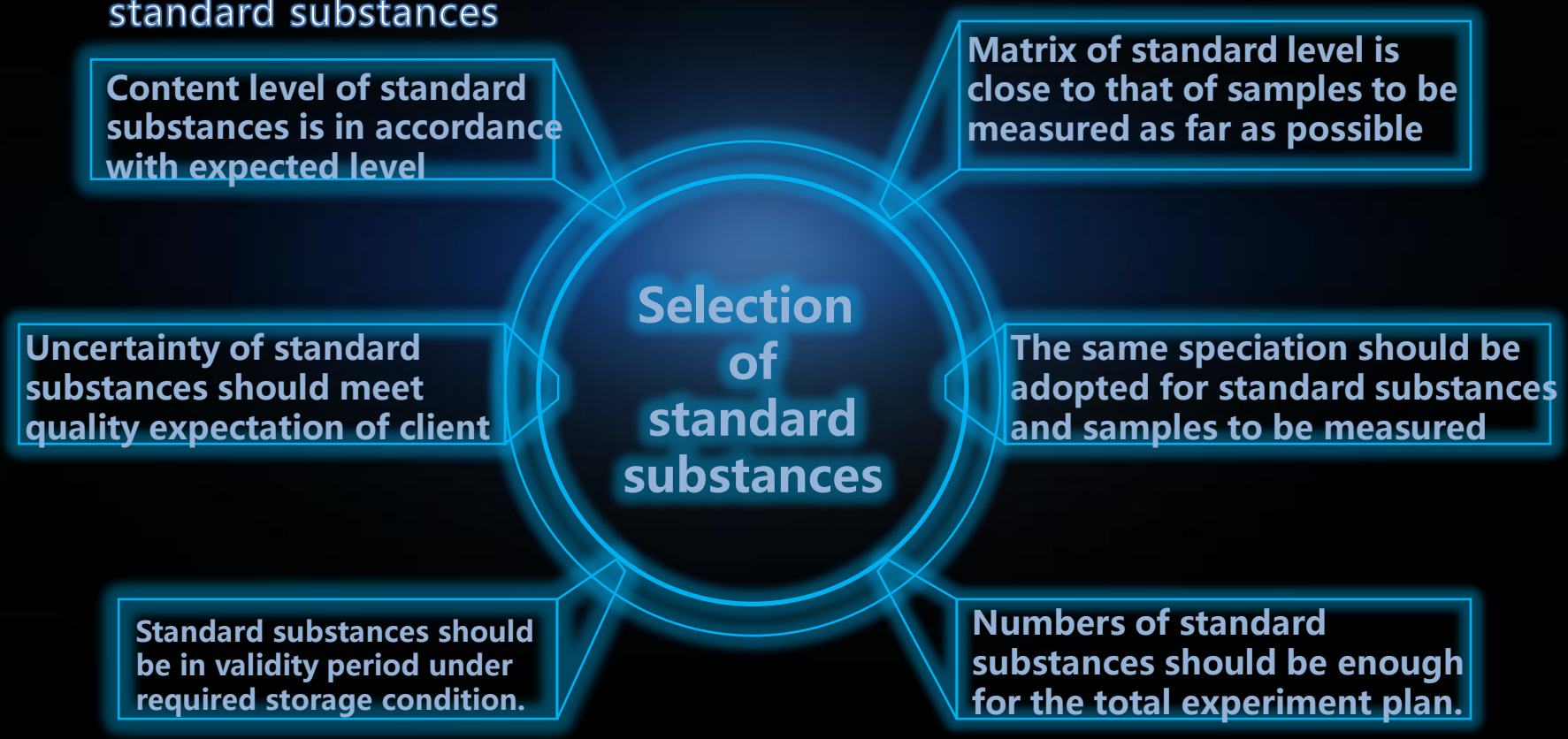
03

Non-metal ores and construction materials

Silicate, clay, feldspar, steatite, kaoline, gypsum, graphite, cement et al.

03 Classification and usage of standard substances

▲ selection principle of standard substances



04

Test quality control of regional geochemical sample

04 Test quality control of regional geochemical sample

Regional geochemical investigation

- Geochemical mapping in low density region, 1 : 1 ,000,000
- 1:200,000 is for regional geochemical exploration, 1:500,000 is for rare region, 1:200,000 is adopted currently.
- 1:50,000, 1:10,000, and 1:5000 is for general geochemical investigation.
- 1:250,000 for multipurpose regional geochemical investigation
- 1:250,000 and 1:50,000 is for regional geochemical assessment to serve multipurpose regional geochemical investigation
- 1:50,000 is for land quality geochemical assessment mainly, 1:250,000, 1:10,000 and 1:5,000 is adopted.

04 Test quality control of regional geochemical sample

Current management standard of analysis test quality

- DZ/T 0258-2014 Specification of Multi-Purpose Regional Geochemical Survey (1:250000)
- DZ/T 0167-1995 Specification of Regional Geochemical Survey (1:200000)
- DZ/T 0011-2015 Specification of Semi-detailed Geochemical Survey (1:50000)
- DZ/T 0289-2015 Specification of Regional Ecosystem Geochemistry Assessment
- DZ/T 0145-2017 Specification of Soil Geochemistry Survey
- DZ/T 0295-2016 Specification of Land Quality Geochemistry Assessment
- DZ/T0248-2014 Technical Regulation of Geochemical Rock Survey
- Specification of Regional Geochemical Exploration (1:250000)(draft for deliberation) 2010

Selection of analysis method

▲Requirement of method detection limit

Requirement of method detection limit for various indicator unit: μg/g

element	Detection limit (D_L)			element	Detection limit (D_L)		
	Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed Geochemical Survey		Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed Geochemical Survey
Ag	0.02	0.02	0.03	F	100	100	100
As	1	1	1	Ga	2	2	--
Au	0.0003	0.0003	0.0003	Ge	0.1	0.1	--
B	1	5	5	Hg	0.0005	0.0005	0.0005
Ba	10	50	50	I	0.5	0.5	--
Be	0.5	0.5	1	La	5	30	40
Bi	0.05	0.1	0.1	Li	1	5	10
Br	1.0	1.0	--	Mn	10	30	30
Cd	0.03	0.05	0.1	Mo	0.3	0.4	0.5
Ce	1	1	--	N	20	20	--
Cl	20	20	--	Nb	2	5	5
Co	1	1	1	Ni	2	2	3
Cr	5	15	15	P	10	100	100
Cu	1	1	1.5	Pb	2	2	5

Selection of analysis method

▲Requirement of method detection limit

Requirement of method detection limit for various indicator(continued) unit: μg/g

element	Detection limit (DL)			element	Detection limit (DL)		
	Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed Geochemical Survey		Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed Geochemical Survey
Rb	10	10	--	Zn	4	10	15
S	30	50	--	Zr	2	10	10
Sb	0.05	0.1	0.2	SiO_2	0.1*	0.1*	
Sc	1	1	--	Al_2O_3	0.05*	0.05*	
Se	0.01	0.01	--	TFe_2O_3	0.05*	0.05*	Fe 1000
Sn	1	1	1	MgO	0.05*	0.05*	--
Sr	5	5	10	CaO	0.05*	0.05*	--
Th	2	4	5	Na_2O	0.05*	0.05*	--
Ti	10	100	100	K_2O	0.05*	0.05*	--
Tl	0.1	0.1	--	TC	0.1*		--
U	0.1	0.5	1	Corg.	0.1*		--
V	5	20	20	pH	0.10**		--
W	0.4	0.5	0.5	Pd	--	0.0001	--
Y	1	5	7	Pt	--	0.0002	--

◆ Selection of analysis method

▲ Requirement of method accuracy degree

Requirement of method accuracy degree and precision degree

Element content	Accuracy degree $\overline{\Delta \lg C}(GBW) = \lvert \lg \overline{C_i} - \lg C_s \rvert$			Element content	Precision degree $RSD\%(GBW) = \frac{\sqrt{\frac{\sum_{i=1}^{i}(C_i - C_s)^2}{n-1}}}{C_s} \times 100$		
	Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed		Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed
≤3D_L	≤0.10	≤0.10	≤0.13		≤17	≤17	≤15%
≥3D_L	≤0.05	≤0.05	≤0.11		≤10	≤10	≤10%
≥1%	≤0.04	≤0.04	≤0.07		≤8	≤8	≤7%
≥5%		≤0.02				≤3	

Note: average of 12 measured values of each GBW standard substance. Cs is average of standard value of each GBW standard substance. n is measured times for GBW standard substance. Ci is single measured value of each GBW standard substance.

◈Internal quality control in chemical analysis laboratory

▲ accuracy degree control

Accuracy degree control is carried out with primary standard substance. For multi-purpose g**eochemical survey, 12 soil standard substances are added as code sample every 500 samples. For 1:250,000 regional** g**eochemical exploration, 12 stream sediment standard substances are added 9 times each map sheet. For 1:50,000 semi-detailed geochemical survey, 2** primary standard substances or provincial monitoring samples developed are added every 50 samples.

Calculation method:

Logarithmic difference (ΔlgC) between measured value and standard value is calculated separately for each element each analysis.

◆Internal quality control in chemical analysis laboratory

▲ accuracy degree control

Requirement of method accuracy degree and precision degree for routine analysis

Element content	Accuracy degree: $\Delta \lg C(GBW) = \lvert \lg C_i - \lg C_s \rvert$ or $\overline{\Delta \lg C} = \frac{\sum_{i=1}^{4} \lvert (\lg C_{Ri} - \lg C_{RS}) \rvert}{4}$			Precision degree: $\lambda = \sqrt{\frac{\sum_{n=1}^{i} (\lg C_i - \lg C_s)^2}{4-1}}$		
	Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed	Multi-Purpose	Geochemical exploration	1:50,000 Semi-detailed
≤3D_L	≤0. 12	≤0.15	≤0.17	≤0.17	≤0.20	≤0.20
≥3D_L	≤0. 10	≤0.10	≤0.15	≤0. 15	≤0.17	≤0.17
1%-5%	≤0. 07	≤0.07	≤0.10	≤0.10	≤0.12	≤0.15
> 5%	≤0.05	≤0.05	≤0.07	≤0. 08	≤0.08	≤0.07

◆Internal quality control in chemical analysis laboratory

▲ accuracy degree control

Allowable relative deviation or Au standard substances and samples

Content range (ng/g)	relative deviation= $\frac{\lvert A_1 - A_2 \rvert}{\frac{1}{2}(A_1 + A_2)} \times 100\%$
0.3~1	≤100
1~30	≤66.6
>30	≤50

Note: A1, fundamental analysis results; A2, examined analysis results.

◆For multi-purpose geochemical survey, primary standard substances are required to be added. For each element, qualification rate of analysis accuracy degree is ≥98%. For Au, it is ≥96%.

◆ For 1:250,000 geochemical exploration and 1:50,000 semi-detailed geochemical survey , primary standard substances are required to be added. .For each element, qualification rate of analysis accuracy degree is ≥98%. For Au, it is ≥90%.

04 Test quality control of regional geochemical sample

Technique requirement and quality control of total element analysis

◆Internal quality control in chemical analysis laboratory

▲ precision degree control

01

multi-purpose geochemical survey

Precision degree is controlled with primary standard substances, 4 of which are added in each 50 numbers.

02

1:250,000 geochemical exploration

Precision degree is controlled with primary standard substances or provincial monitoring samples developed , 4 of which are added in each 50 numbers.

03

1:50,000 semi-detailed geochemical survey

Precision degree is controlled with primary standard substances or provincial monitoring samples developed , 2 of which are added in each 50 numbers with 100 numbers as a statistic unit.

◈Internal quality control in chemical analysis laboratory

▲percent of report

◆For multi-purpose geochemical survey, required percent of report for each element is >95% and total percent of report is ≥99%.

◆For 1:250,000 geochemical exploration, required percent of report for each element is >95%.

◆For 1:50,000 semi-detailed geochemical survey required percent of report for each element is >90%.

◆Internal quality control in chemical analysis laboratory

▲ Repetitive verification

Range of content	Relative duplicate difference= $\frac{\lvert A_1 - A_2 \rvert}{\frac{1}{2}(A_1 + A_2)} \times 100$		
	Multi-purpose	geochemical exploration	1:50,000 semi-detailed geochemical survey
Less than 3 times detection limit	≤30%	40%	≤50%
More than 3 times detection limit	≤25%	40%	≤50%
Map sheet sampling rate	5%	3%-5%	3%-5%
Original qualification rate of single element	90%	90%	90%
Outlier sampling rate	No requirement	3%	3%
Qualification rate of outlier sampling rate	85%	90%	85%

Note: A1, fundamental analysis results; A2, examined analysis results.

▲ Repetitive verification

For standard substance or monitoring samples in routine analysis, monitoring diagram and parameter table of quality parameters are prepared to determine whether system deviation exists.

04 Test quality control of regional geochemical sample

Technique requirement and quality control of total element analysis

External quality control in chemical analysis laboratory

▲ standard control sample

01 Preparation of standard control sample: multiple group of standard control samples are prepared with primary standard substances having corresponding characteristics according to various ratio to obtain standard control sample with various concentration and matrix. 150 samples in each group.

02 Standard value determination of various elements in standard control samples. In principle, it is determined base on standard value of various element content in original standard substance, and proportion of prepared control samples participated. After calculation, it becomes trial value of various element is standard control sample.

03 Uniformity and standard value verification of prepared standard control samples should be carried out to prevent and eradicate accidental mistake during preparation.

▲ standard control sample added

Prepared standard control samples are added in each batch (about 50 numbers). 4 samples are added in each batch (for 1:50,000 semi-detailed geochemical survey, 2 samples are required.) Vacant number is reserved by sampling institute in advance. Code samples are required to be analyzed with samples at the same time.

04 Test quality control of regional geochemical sample

Technique requirement and quality control of total element analysis

◆External quality control in chemical analysis laboratory

▲quality parameter of standard control sample

Accuracy degree of standard control sample

With 150 standard control samples as a statistic unit. Logarithmic difference between measurement value and standard value of standard control samples is analyzed statistically based on single control unit and single element. Permission limit should be in accordance with internal quality control of "Requirement of daily analysis accuracy degree and precision degree with single element qualification rate of more than 90%.

Precision degree of standard control sample

Logarithm standard deviation λ of single element control sample is analyzed statistically according to batch, 1:50,000 map sheet,1:100,000 map sheet or entire map sheet element. Permission limit should be in accordance with internal quality control of "Requirement of routine analysis accuracy degree and precision degree with single element qualification rate of more than 90%.

Correlation between measurement value and standard value of standard control samples

With 150 standard control samples as a statistic unit. Correlation coefficient R between standard control sample measurement value of single element and standard trial value is analyzed statically, besides, parameters such as Xmin, Xmax and median are considered. For R of single element, R≥0.900 is required.

Equal precision test between measurement value and standard value of standard control samples

With 150 standard control samples as a statistic unit. Variance between measurement value and standard value is analyzed statically. Variance test (F test) of two samples is compared. F test value is required less than F critical value.

04 Test quality control of regional geochemical sample

Technique requirement and quality control of total element analysis

◆ Utilization quality feedback of test data

▲Control of suppositional similar figure

Suppositional figure of standard control sample

01 Based on trial value of various element in added control samples, ranking bitmap is drawn with ranking 1 : 50000 map sheet. With SUFFER, suppositional contour geochemical diagram of various element in 150 standard control samples are drawn as suppositional standard geochemical diagram for similarity comparison.

Precision degree of standard control sample

02 Based on analysis report data provided by the lab, 150 standard control sample data are rejected, based on which, suppositional geochemical diagrams of various element are drawn according the method above.

Correlation between measurement value and standard value of standard control samples

03 Similarity discrimination of analysis quality is carried out for total data provided by the lab with visual comparison method combined with parameters such as accuracy degree and precision degree of control samples analyzed statically.

◈ Utilization quality feedback of test data

▲ Element geochemical diagram control

Based on sample analysis data provided by the lab, according to corresponding requirement, various element geochemical diagram is drawn. Based on the conformity between background (and abnormal condition) and geological condition, sample analysis data quality is assessed in general.


MANY THANKS