EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 032

CERTIFICATE OF ANALYSIS

NATURAL MOROCCAN PHOSPHATE ROCK (Phosphorite)			
	Mass fraction based on dry mass		Number of accepted individual measurements
	Certified value [1] [g/kg]	Uncertainty [2] [g/kg]	
Ca expressed as CaO	518	4	70
Total P expressed as P_2O_5	329.8	1.7	85
Carbonate Carbon expressed as CO_2	51.0	0.8	60
F	40.4	0.6	80
Si expressed as SiO_2	20.9	1.2	60
Total S expressed as SO_3	18.4	0.8	75
Al expressed as Al_2O_3	5.5	0.6	80
Mg expressed as MgO	4.0	0.1	65
Fe expressed as Fe_2O_3	2.3	0.1	65

[1] The certified value is the unweighted mean of individual measurements obtained by different laboratories. The certified value is traceable to SI.
[2] The uncertainty is estimated standard deviation of reproducibility which. It accounts for the precision and bias of the participating laboratories as well as for any inhomogeneity of the material.

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 1 g.

NOTE

This material has been certified by BCR (Community Bureau of Reference, the former reference materials programme of the European Commission). The certificate has been revised under the responsibility of IRMM.

Brussels, November 1979
Latest revision: March 2010

Signed: 

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Indicative Values

	Mass fraction based on dry mass		Number of accepted sets of data p
	Certified value [1] [mg/kg]	Uncertainty [2] [mg/kg]	
As	9.5	0.5	7
B	22.6	2.2	6
Cd	20.8	0.7	12
Cr	257	16	12
Co	0.59	0.06	9
Cu	33.7	1.4	14
Hg	0.055	0.011	6
Mn	18.8	1.3	13
Ni	34.6	1.9	11
Ti	171	10	10
V	153	7	12
Zn	253	6	9

1) This value is the unweighted mean of p accepted sets of results. The certified value is traceable to SI.
2) The 95% confidence interval is a measure of the uncertainty and is applicable when the reference material is used for calibration purposes.

When the reference material is used to assess the performance of a method, the user should refer to the recommendations laid down in the last chapter (instructions for use) of the certification report. In particular he should use the values of the within-laboratory set standard deviation (S_W), and of the between-laboratory set standard deviation (S_B) given there.

Additional Material Information

	Mass fraction based on dry mass	
	Estimated value	
Na expressed as Na_2O	8.6	g/kg
K expressed as K_2O	0.9	g/kg
Organic C expressed as C	1.6	g/kg
Ag	2	mg/kg
Mo	2-4	mg/kg
Pb	5.4	mg/kg
Sb	3	mg/kg
Se	10	mg/kg
Th	2	mg/kg
U	125	mg/kg

DESCRIPTION OF THE SAMPLE

The sample consists of approximately 100 g of thoroughly mixed finely ground material (particle size < 100 µm) taken from a batch of a natural Moroccan phosphate rock usually employed for the production of phosphate fertilizers. The sample is homogenous at least to a 1 g level. The sample is available in brown glass bottles closed with a double plastic stopper.

ANALYTICAL METHOD USED FOR CERTIFICATION

CaO	:	Volumetric method with $KMnO_4$, titration with EDTA
P_2O_5	:	Quinoline phosphomolybdate gravimetry, spectrophotometric method, X-ray fluorescence
CO_2	:	Gravimetry of CO_2 evolved by acid attack, titration of CO_2 in non-aqueous medium, conductimetric measurement of CO_2
F	:	Spectrophotometric and volumetric methods after distillation of F, ion selective electrode
SiO_2	:	Gravimetric methods, spectrophotometric method after alkaline fusion, X- ray fluorescence, inductively coupled plasma
SO_3	:	Gravimetry after acid dissolution, reduction to S^{2-} and titration with mercuric solution
Al_2O_3	:	Atomic absorption spectrometry, gravimetric method with 8-hydroxyquinoline, spectrophotometric method, X-ray fluorescence, neutron activation analysis
MgO	:	Atomic absorption spectrometry, inductively coupled plasma
Fe_2O_3	:	Atomic absorption spectrometry, spectrophotometric methods, X-ray fluorescence, inductively coupled plasma.

- Hydride atomic absorption spectrometry
- Neutron Activation analysis
- Spectrophotometry
- Voltammetry
- Photoneutron activation analysis
- Photon activation analysis
- Charged particle activation analysis
- Inductively coupled plasma emission spectrometry
- Neutron capture activation analysis
- Atomic absorption spectrometry
- Isotope dilution mass spectrometry
- Potentiometric stripping analysis
- Graphite furnace atomic absorption spectrometry
- Solid sample atomic absorption spectrometry
- Micro wave plasma emission spectrometry
- Cold vapour atomic absorption spectrometry
- Cold vapour atomic fluorescence spectrometry

PARTICIPANTS

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- CNR, Centro Radiochimica, Pavia (IT)
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- Windmill Holland BV, Vlaardingen (NL)

SAFETY INFORMATION

The usual laboratory safety precautions apply.

INSTRUCTIONS FOR USE

Once the bottle has been opened, the material is susceptible to contamination (e.g. by laboratory dust or vapour) or losses. Precautions with regards to storage container and temperature should be taken.
The portion for analysis shall be taken as it is. The moisture content should be determined by drying a portion of the sample at 105 °C during 2 hours.

STORAGE

The material can be stored at room temperature.
However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

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NOTE

A technical report on the production of BCR-032 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

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