EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Reference Materials and Measurements

CERTIFIED REFERENCE MATERIAL
BCR® – 038

CERTIFICATE OF ANALYSIS

FLY ASH FROM PULVERISED COAL					
	Mass fraction				Number of accepted sets of data p
	Certified value [1]		Uncertainty [2]		
As	48.0	mg/kg	2.3	mg/kg	9
Cd	4.6	mg/kg	0.3	mg/kg	7
Cl	323	mg/kg	22	mg/kg	10
Co	53.8	mg/kg	1.9	mg/kg	9
Cr	192	mg/kg	10	mg/kg	7
Cu	176	mg/kg	9	mg/kg	11
F	538	mg/kg	13	mg/kg	8
Fe	33.8	g/kg	0.7	g/kg	12
Hg	2.10	mg/kg	0.15	mg/kg	8
Mn	479	mg/kg	16	mg/kg	13
Na	3.74	g/kg	0.15	g/kg	10
Pb	262	mg/kg	11	mg/kg	11
Zn	581	mg/kg	29	mg/kg	10

1) The value is the unweighted mean of p values, each value being the mean of a set of results obtained by a different method and/or laboratory. The certified values are traceable to the SI.

2) The uncertainty is taken as the half-width of the 95 % confidence interval of the certified mean defined in [1]

This certificate is valid for one year after purchase.

Sales date:

The minimum amount of sample to be used is 250 mg for Cl and F determinations and 50 mg for all other parameters.

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, October 1995
Revised: July 2007

INFORMATION ONLY

Prof. Dr. Hendrik Emons
Unit for Reference Materials
EC-JRC-IRMM
Retieseweg 111
2440 Geel, Belgium

Indicative Values		
	Mass Fraction	
	Indicative value [1] [mg/g]	Uncertainty [2] [mg/g]
Water soluble sulphate	7.05	0.19

1) The value is the unweighted mean of values, each value being the mean of a set of results obtained by a different method and/or laboratory. The indicative values are traceable to the SI.
2) The uncertainty is taken as the half-width of the 95 % confidence interval of the certified mean defined in [1].

Additional Material Information	
	Mass Fraction
	Value [1] [mg/kg]
Ni	194
Th	17.3
V	334

1) The values are traceable to the SI.

DESCRIPTION OF THE SAMPLE

The material consists of a fly ash powder in a glass ampoule containing approximately 5 - 6 g. The material preparation, homogeneity and stability studies and methods used in the certification are described in the report EUR 8080 EN (1982); separate reports EUR 16840 EN (1996) and EUR 15418 EN (1994) describe the additional certifications of Cr and, Cl and F, respectively.

ANALYTICAL METHOD USED FOR CERTIFICATION

- Argentometric titration
- (Cold vapour, Hydride, Flame or Electrothermal) atomic absorption spectrometry
- Differential pulse anodic stripping voltammetry
- (Flame) Emission spectrometry
- Inductively coupled plasma atomic emission spectrometry
- Instrumental neutron activation analysis
- Ion chromatography (after combustion, fusion or pyrohydrolysis)
- Ion selective electrode (after fusion or pyrohydrolisis)
- Isotope dilution mass spectrometry
- Neutron activation analysis with radiochemical separation
- Neutron activation analysis with fast neutrons
- Photon activation analysis
- Pulse polarography
- Spectrophotometry
- Titrimetry
- Visual spectrometry
- Voltametry

PARTICIPANTS

- Bundesanstalt für Materialprüfung, Berlin (DE)
- Centraal Laboratorium TNO, Delft (NL)
- Centro di Radiochimica e Analisi per Attivazione del CNR, Pavia (IT)
- Centro di Studi sulla Chimica Analitica Strumentale del CNR, Bari (IT)
- Danish Technological Institute, Hasselager (DK)
- ENEL, Pisa (IT)
- Energieonderzoek Centrum Nederland ECN, Petten (NL)

- Environmental and Medical Science Division, AERA, Harwell (GB)
- Estel-Hoogovens b.v., IJmuiden (NL)
- European Commission, Joint Research Centre, CETIS, Ispra (IT)
- European Commission, Joint Research Centre, Environment Institute (EI), Ispra (IT)
- European Commission, Joint Research Centre, Materials Division, Petten (NL)
- Experimental Station for Fuel, San Donato (IT)
- Forschungszentrum für Umwelt und Gesundheit (GSF), Oberschleißheim (DE)
- Gemeentelijk Centraal Milieulaboratorium, Amsterdam (NL)
- Gesellschaft für Strahlen und Umweltforschung, Neuherberg (DE)
- INERIS, Verneuil (FR)
- Institut de Recherches de la Sidérurgie Française, Mazières-les-Metz (FR)
- Institut für Reinstoffanalyse (MPG), Schwäb, Gmünd (DE)
- Institut für Wasser-, Boden- und Lufthygiene des Bundesgesundheitsamtes, Berlin (DE)
- Instituut voor Nucleaire Wetenschappen, Gent (BE)
- Istituto di Chimica Analitica, Università degli Studi, Roma (IT)
- Istituto Superiore di Sanità, Roma (IT)
- Kernforschungsanlage, Jülich (DE)
- Kernforschungszentrum, Karlsruhe (DE)
- Keuringsdienst voor Electrische Materialen, Arnhem (NL)
- Laboratorio sull'Inquinamento Atmosferico del CNR, Roma (IT)
- Laboratory of the Government Chemist, London (GB)
- Livsmedels Verket, Uppsala (SE)
- Risø National Laboratory, Roskilde (DK)
- Ruhrkohle AG, Essen (DE)
- Service Central d'Analyse (CNRS), Vernaison (FR)
- Studiecentrum voor Kernenergie SCK-CEN, Mol (BE)
- TÜV, Essen (DE)
- Universidad de Barcelona, Depto. de Química Analítica, Barcelona (ES)
- Universitaire Instelling Antwerpen, Antwerpen (BE)
- Universiteit Gent, Gent (BE)
- University of Plymouth, Plymouth (GB)
- University of Technology, Loughsborough (GB)
- VTT, Chemical Technology, Espoo (FI)

SAFETY INFORMATION

The special safety precautions should be taken to avoid breathing in of the material. The material particle size is < 10 µm. Particles in this size range can be drawn deep into the lungs.

INSTRUCTIONS FOR USE

To ensure long term stability of the trace element mass fractions in the sample, it is sealed in hard-glass ampoules. Care must be taken to avoid contamination in opening the ampoule: it is recommended to scratch at the narrower part of the ampoule with a cadmium-free glass knife and remove the upper part by a soft strike or by gently heating the scratch e.g. with a hot soft-glass rod. Precautions should be taken to avoid contamination once the ampoule has been opened. The correction to dry mass should be made on a separate portion of 100 mg which should be dried in an oven at (105 ± 2) °C for 3-4 h until constant mass is attained (successive weighings should not differ by more than 1 mg).
The reference material is intended for the verification of the methods and not for calibration purposes. If the material is used for calibration purposes or to asses the performance of a procedure, the user should refer to the recommendations in the certification report.

STORAGE

Upon arrival, the material should be stored in closed ampoules at ambient temperature (ranging between 4 and 25 ºC) in dark.
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

Neither IRMM, its subsidiaries, its contractors nor any person acting on their behalf,
(a) make any warranty or representation, express or implied that the use of any information, material, apparatus, method or process disclosed in this document does not infringe any privately owned intellectual property rights; or
(b) assume any liability with respect to, or for damages resulting from, the use of any information, material, apparatus, method or process disclosed in this document save for loss or damage arising solely and directly from the negligence of IRMM or any of its subsidiaries.

NOTE

A technical report on the production of BCR-038 is available on the internet (http://www.irmm.jrc.be). A paper copy can be obtained from IRMM on request.

European Commission – Joint Research Centre
Institute for Reference Materials and Measurements (IRMM)
Retieseweg 111, 2440 Geel (Belgium)
Telephone: +32-(0)14-571.722 - Telefax: +32-(0)14-590.406