

Tel./Fax: ++42155633 6834



Producer:

*pb-anal, Hlinkova 25, 04001 Košice, Slovakia*  
*Institute of Radioecology, Komenského 9, 04001 Košice, Slovakia*

## CERTIFICATE

### REFERENCE MATERIAL

#### SLUDGE FROM CITY WATER TREATMENT – WT-L

Issued in accordance with § 7 of the Slovak Act No. 142/2000, Coll.

Registration No.: 103/07

Sort of material

*Sludge from city water treatment – WT-L*

Code:

*12-3-12*

Certified values of individual major elements contents with expanded uncertainties (for  $k = 2$ )

Element	Mass fraction [%]	U [%]	Element	Mass fraction [%]	U [%]
Al	3.03	0.21	Mg	0.781	0.069
Ca	8.8	0.82	P	0.881	0.036
Fe	1.70	0.17	S	1.02	0.07

Certified values of individual minor elements contents with expanded uncertainties (for  $k = 2$ )

Element	Mass fraction [µg/g]	U [µg/g]	Element	Mass fraction [µg/g]	U [µg/g]
Ag	11.9	1.3	Hg	4.25	0.59
As	8.87	1.29	Mn	390	22
Ba	781	69	Ni	32.0	2.9
Bi	3.73	0.55	Pb	122	9
Cd	1.97	0.29	Sb	17.8	3.1
Co	6.77	0.92	Sr	170	23
Cr	79.0	10.9	V	41.3	3.3
Cu	136	13	Zn	1 310	70

Relationship:

Interlaboratory comparison by ISO Guide 35: 1989

Packing:

(40±5) g

Minimal sample size:

200 mg

Charge:

12-3-12-10307

Validity:

November 2016


Authority responsible for

preparation and certification :

RNDr. Štefan Barthá

In Bratislava, 20.9.2007



  
Ing. Viliam Pätoprstý, PhD.  
Director of Chemical Centre

**Certification conditions:** For certification of the reference material a method of inter-laboratory comparison by ISO Guide 35 was used. The certified values are expressed as average values from repeated measurements at least in 8 laboratories using at least 2 different analytical techniques, with the elimination of outlying results. Uncertainties are expressed in form of expanded uncertainty with uncertainty coefficient  $k=2$ .

**Properties:** Powder material, size of particles  $<0.08$  mm

**Homogeneity:** CRM homogeneity is guaranteed for weights  $>100$  mg

**Storage:** Keep in a dark, dry and cool room. After opening it, keep a well closed bottle in refrigerator under the temperature of  $3-5^{\circ}\text{C}$ .

**Expected use:** Verification of the correctness of analytical procedures employed at the analysis of samples with similar matrixes, validation of measurement methods.

**Instruction for use:** Prior to each use, the humidity in respective part of the reference material is determined by drying at temperature of  $105^{\circ}\text{C}$  to reach the constant mass. The rest of the reference material is treated according to requirements of the analytical procedure in use (ignition, converting into solution, extraction, briquetting/caking ...).

### Informative values of mass fraction of different elements

Informative values of the mass fraction of individual elements and their standard uncertainties:

Element	Mass fraction ( $\mu\text{g/g}$ )	U [ $\mu\text{g/g}$ ]
B	33.6	10.5
Be	0.79	0.25
Cl	388	65
Li	15.3	3.0
Mo	3.65	1.47
Se	0.90	0.21
Sn	10.8	1.9

\* mass fraction in ng/g

Element	Mass fraction ( $\mu\text{g/g}$ )	U [ $\mu\text{g/g}$ ]
K	0.695	0.150
Na	0.414	0.109
Si	11.1	0.6

U - expanded uncertainty

The informative values are expressed as average values from repeated measurements at least in 5 laboratories using at least 2 different analytical techniques, with the elimination of outlying results. Uncertainties are expressed in form of expanded uncertainty with uncertainty coefficient  $k=2$ .





Informative values without uncertainties:

Element	Mass fraction [μg/g]
Au	0.7
Br	10
Ce	30
Cs	3
Eu	0.5
Hf	3
La	15
Lu	0.2
Nb	7
Nd	15
Rb	45

Element	Mass fraction [μg/g]
Sc	5
Sm	3
Ta	0.5
Tb	0.4
Th	5
Ti	1 000
U	2
W	3
Y	10
Yb	1
Zr	100

## Participating laboratories:

1. Institut jaderných issledovanij i jadernoj energetiky, Sofia, Bulgaria
2. Ecole Polytechnique Montreal, Montreal, Canada
3. ČSAV, Ústav geológie a geotechniky, Praha, Czechoslovakia
4. Ústav rádioekológie a využitia jadrovej techniky, Košice, Czechoslovakia
5. Farmaceutická fakulta, Katedra analytickej chémie, Bratislava, Czechoslovakia
6. Výzkumný ústav energetický, Praha, Czechoslovakia
7. Výzkumný ústav stavebních hmot, Brno, Czechoslovakia
8. Geologický průzkum n. p., Brno, Czechoslovakia
9. Ústřední laboratoř ČSÚP, Stráž pod Ralskem, Czechoslovakia
10. Přírodovedencká fakulta UK, Katedra analytickej chémie, Bratislava, Czechoslovakia
11. Ústav jadrového výzkumu, Řež u Prahy, Czechoslovakia
12. Palivový kombinát, 25 února k.p., Vřesová, Czechoslovakia
13. Fyzikální ústav ČSAV, Praha, Czechoslovakia
14. Výzkumný ústav pro hnědé uhlí, Most, Czechoslovakia
15. Oravské ferozliatinárske závody, n.p., Istebné, Czechoslovakia
16. VŠB, Katedra geológie a mineralógie, Ostrava-Poruba, Czechoslovakia
17. Geologický prieskum, n.p., Spišská Nová Ves, Czechoslovakia
18. Akademie der Wissenschaften der DDR, Zentralinstitut für Isotopen und Strahlenforschung, Leipzig, DDR
19. Humboldt-Universität zu Berlin, Bereich Medizin (Charite), Berlin, DDR
20. Institut für Physik der Universität Hohenheim, Stuttgart, Federal Republic of Germany
21. Bayerisches Landesamt für Umweltschutz, München, Federal Republic of Germany
22. Niedersächsisches Landesamt für Immissionsschutz, Institut für Arbeitsmedizin, Hannover, Federal Republic of Germany
23. Fachbereich Anorganische Chemie und Kerchemie, Technische Hochschule Darmstadt, Darmstadt, Federal Republic of Germany
24. Helsinki University of Technology, Department of Chemistry, Espoo, Finland
25. Environmental and Food Laboratory of Helsinki, Helsinki, Finland
26. National Public Health Institute, Helsinki, Finland
27. Technical University of Budapest, Training Reactor, Budapest, Hungary
28. Hungarian Geological Survey, Budapest, Hungary
29. Government of India, Air Monitoring Section, Bhabha Atomic Research Centre, Bombay, India
30. Institute for Physics and Nuclear Engineering, Bucharest, Romania
31. US Department of Energy, Environmental Measurements Lab., New York, U.S.A.



32. Institut gorjučich iskopaemych, Moskva, USSR
33. Physics Institute, Latvian SSR Academy of Sciences, Riga, USSR
34. Istitut jadernoj fiziki AN UzSSR, Taškent, USSR
35. Slovenská geológia š.p., Spišská Nová Ves, Slovakia
36. Ekologické laboratória, Spišská Nová Ves, Slovakia
37. Oravské ferozliatinárske závody, Istebné, Slovakia
38. Geoeologické laboratória š.p., Turčianske Teplice, Slovakia
39. pb-anal, Košice, Slovakia
40. Geoanalytické laboratória, Spišská Nová Ves, Slovakia
41. pb-anal, Košice, Slovakia
42. VVDVÚ, Košice, Slovakia

*Appendix: Laboratories No. 1 - 34 are participants from intercomparison analyses in 1985 year.  
Laboratories No. 35 - 39 are participants from intercomparison analyses in 1996 year.  
Laboratories No. 40 - 42 are participants from intercomparison analyses in 2006 year.*

#### Used analytical methods:

##### INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS - GENERAL

INAA – short irradiation

INAA – long irradiation

INAA – with radioisotope separation

##### ATOMIC ABSORPTION SPECTROMETRY - GENERAL

AAS – flame technique

AAS – flameless technique

AAS – hydride technique

AAS – cold vapour techniques

AAS – other methods (TMA, AMA)

##### ATOMIC EMISSION SPECTROMETRY - GENERAL

AES – flame technique

AES – ICP

AES – ICP + MS

AES – other methods

##### X – RAY SPECTROMETRY - GENERAL

RFA – energy dispersive

RFA – wavelength dispersive

##### MOLECULAR SPECTROMETRY - GENERAL

Spectrometry UV-VIS

##### MASS SPECTROMETRY - GENERAL

MS – spark source

##### ELECTROCHEMICAL METHODS - GENERAL

DPP

Another

##### CHEMICAL METHODS - GENERAL

Gravimetric analysis

Volumetric analysis

##### OTHER METHODS





**Recertification:** CRM re-certification was performed in year 2006, on the base of stability confirmation of previously certified values. This confirmation is based on inter-laboratory analyses (by 3 different labs and 4 different measuring techniques) of Pb, Cu, Mn, K and Mg.

**Analytical technique:**

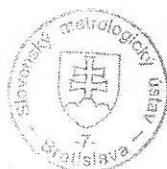
AAS – flame technique  
RFA – energy dispersive  
DPP

**Participants:**

Geoanalytické laboratóriá, Spišská Nová Ves, SLOVAKIA  
pb-anal, Lomená 1, Košice, SLOVAKIA  
VVDVÚ, Kukučínova 2, Košice, SLOVAKIA

Commission for Certified Reference Materials (CCRM) of the Slovak Republic on the base of obtained results and in accordance with its No. 1/2007 from its meeting decided to prolong the expire date of those CRM to 30/11/2016.

**In case of deterioration of the reference material by the user, the manufacturer is relieved from the liability to guarantee the certified values!**



**Distributed by:**

Labmix24 GmbH  
Jonas-Elkan-Weg 4  
46499 Hamminkeln, GERMANY  
Phone: +49 2856 90924-0  
Fax: +49 2856 90924-24  
[info@labmix24.com](mailto:info@labmix24.com)  
[www.labmix24.com](http://www.labmix24.com)

