

**The Appendix is an integral part of
Certificate of Accreditation No.: 210/2022 of 03/05/2022**

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

Vysoká škola báňská - Technická univerzita Ostrava
Nanotechnology Centre
17. listopadu 2172/15, 708 00 Ostrava - Poruba

Testing laboratory locations:

1. CNT Laboratories 17. listopadu 2172/15, 708 00 Ostrava-Poruba

2. IET Laboratories 17. listopadu 2172/15, 708 00 Ostrava-Poruba

The laboratory has a flexible scope of accreditation permitted as detailed in the Annex.

Updated list of activities provided within the required flexible scope of accreditation is available at the laboratory from the Laboratory Quality Manager.

The laboratory provides expert opinions and interprets test results.

Tests:

| Ordinal number ¹ | Test procedure/method name | Test procedure/method identification ² | Tested object |
|-----------------------------|---|--|---|
| 1 ¹ | Determination of humidity by gravimetry | SOP č. OAA-02-01 (ČSN 72 0102, ČSN EN ISO 17892-1, ČSN EN 12880, ČSN ISO 11465, ČSN 72 1206, ČSN 44 1377, ČSN ISO 579, ČSN ISO 687, ČSN EN ISO 18134-2, ČSN EN ISO 18134-3, ČSN EN 15414-2, ČSN EN ISO 21 660-3) | Soils, sediments, solid waste, solid fuels, building and silicate materials |
| 2 ¹ | Determination of loss on ignition by gravimetry | SOP no. OAA-02-02 (ČSN 72 0103, ČSN 1744-1+A1, ČSN EN 196-2, ČSN 72 1206) | Soils, sediments, solid waste, solid fuels, building and silicate materials |
| 3 ¹ | Determination of ash by gravimetry | SOP no. OAA-02-04 (ČSN ISO 1171) | Solid fuels |
| 4 ¹ | Determination of suspended solids by gravimetry | SOP no. OAA-02-06 (ČSN EN 872) | Surface, ground and waste water |
| 5 ¹ | Determination of dissolved substances and inorganic dissolved salts by gravimetry | SOP no. OAA-02-07 (ČSN 75 7346) | Drinking water, surface, ground and waste water, aqueous extracts |

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| Ordinal number ¹ | Test procedure/method name | Test procedure/method identification ² | Tested object |
|-----------------------------|---|--|---|
| 6 ¹ | Determination of sulphates by gravimetry | SOP no. OAA-02-09 (ČSN EN 1744-1+A1, ČSN EN 196-2, ČSN 72 1206, ČSN 72 0117) | Silicate materials, cement, stone aggregates, gypsum |
| 7 ¹ | Determination of total sulphur by gravimetry and determination of specific sulphur by calculation | SOP no. OAA-02-10 (ČSN 72 0118, ČSN 44 1379, ČSN EN 1744-1+A1 ČSN 72 0101) | Silicate materials, stone aggregates, solid fuels |
| 8 ¹ | Determination of carbonate by gravimetry | SOP No. OAA-02-13 (ČSN 72 0121) | Silicate materials, slag, fly ash, gypsum from energy production |
| 9 ¹ | Determination of insoluble compounds in hydrochloric acid and sodium carbonate by gravimetry | SOP no. OAA-02-12 (ČSN EN 196-2) | Cement |
| 10 ¹ | Determination of pH by potentiometry | SOP no. OAA-04-01 (ČSN ISO 10523) | Drinking water, surface, ground and waste water and aqueous extracts |
| 11 ¹ | Determination of electrical conductivity | SOP no. OAA-04-02 (ČSN EN 27888) | Drinking water, surface, ground and waste water and aqueous extracts |
| 12 ¹ | Determination of Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb and Zn by flame AAS method | SOP no. OAA-05-01A (Manual to the device used, US EPA methods) ³⁾⁴⁾ | Drinking water, surface, ground and waste water and aqueous extracts, acid extracts, emissions – absorption solutions |
| 13 ¹ | Determination of Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb and Zn by flame AAS method | SOP no. OAA-05-01B (Manual to the device used, US EPA methods) ³⁾⁴⁾ | Waste, building and silicate materials, emissions – filtration medium |
| 14. ¹ | Determination of As, Be, Cd, Co, Cu, Mn, Mo, Ni, Sb, Se and Sn by electrothermal AAS method | SOP no. OAA-05-02A (Manual to the device used, US EPA methods) ³⁾⁴⁾ | Drinking water, surface, ground and waste water and aqueous extracts, acid extracts, emissions – absorption solutions |

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|-----------------------------|---|---|--|
| 15 ¹ | Determination of As, Be, Cd, Co, Cu, Mn, Mo, Ni, Sb, Se and Sn by electrothermal AAS method | SOP no. OAA-05-02B (Manual to the device used, US EPA methods) ³⁾⁴⁾ | Waste, building and silicate materials, emissions – filtration medium |
| 16 ¹ | Determination of Hg by analyzer AMA 254 | SOP no. OAA-05-04 (Manual to AMA-254) | Drinking water, surface, ground and waste water and aqueous extracts, acid extracts, waste, solid fuels, emissions – absorption solutions and filtration medium |
| 17 ¹ | Determination of Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Ti, V and Zn by ICP-AES method | SOP no. OAA-06-01A (US EPA method 6010) ³⁾⁴⁾ | Drinking water, surface, ground and waste water and aqueous extracts, acid extracts, emissions – absorption solutions |
| 18 ¹ | Determination of Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Ti, V and Zn by ICP-AES method | SOP no. OAA-06-01B (US EPA method 6010) ³⁾⁴⁾ | Waste, building and silicate materials, emissions – filtration medium |
| 19 ¹ | Determination of Na, Mg, Al, Si, P, S, K, Ca, Ti, Fe, Mn, Cl, V, Cr, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, In, Sn, Sb, Te, I, Cs, Ba, La, Ce, Ta, W, Hg, Tl, Pb, Bi, Th and U by XRFS method | SOP no. OAA-07-01 (Manual to Spectro Xepos) | Soils, sediments from streams and reservoirs, solid fuels, building and silicate materials, waste from solid fuel combustion, waste from iron production and processing, waste from building materials, dumps from mining activities, emissions - filtration media |
| 20 ¹ | Determination of P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Br, Mo, Ag, Cd, Sn, Ba, Pb by XRFS method | SOP no. OAA-07-02 (Manual to Spectro Xepos) | Liquid and paste waste, oils |
| 21 ¹ | Spectrometric determination of phenol index | SOP no. OAA-08-12 (ČSN ISO 6439) | Drinking water, surface, ground and waste water |

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| Ordinal number ¹ | Test procedure/method name | Test procedure/method identification ² | Tested object |
|-----------------------------|--|--|---|
| 22 ¹ | Determination of total carbon (TC), total organic carbon (TOC) and dissolved organic carbon (DOC) by IR spectrometry method | SOP no. OAA-08-15 (ČSN EN 1484, Manual to Multi N/C 3100) | Drinking water, surface, ground and waste water |
| 23 ¹ | Determination of total carbon (TC) and total organic carbon (TOC) by IR spectrometry method | SOP no. OAA-08-16 (ČSN EN 13137:2002, Manual to Multi N/C 3100, HT1300) | Waste, sludge, sediment |
| 24 ¹ | Determination of Mo by electrothermal AAS method | SOP no. OAA-05-02C (Manuals to device, US EPA methods) ³⁾⁴⁾ | Solid fuels |
| 25 ¹ | Determination of B, Be by ICP-AES method | SOP no. OAA-06-01C (US EPA method 6010, research papers) ³⁾⁴⁾ | Solid fuels |
| 26 ¹ | Determination of sulphur and halogens by combustion after decomposition in calorimetric reactor using ion chromatography with conductivity detection | SOP no. OOA-10-05 (US EPA method 5050) | Solid and liquid fuels, solid alternative fuels, biomass, biofuels, waste |
| 27 ¹ | Determination of anions by ion chromatography with conductivity detection | SOP no. OOA-10-11 (US EPA method 1011B, materials of Waters) | Drinking water, surface, ground and waste water and aqueous extracts, emission – absorption solutions |
| 28 ¹ | Determination of concentration of chlorides in solid phase by volumetric method | SOP no. OOA-92-53 (ČSN EN 196-2) | Cement, slag, fly ash |
| 29 ¹ | Determination of PCB by gas chromatography method (GC/MS) | SOP no. OOA-80-80 (US EPA method 8080A) | Sediments, waste, oils |
| 30 ¹ | Determination of C ₁₀ -C ₄₀ hydrocarbons by the method of gas chromatography with FID detector | SOP no. OOA-80-15 (US EPA method 8015C, ČSN EN 14039) | Waste |
| 31 ¹ | Determination of polycondensed aromatic hydrocarbons by HPLC/PDA/FD method | SOP no. OOA-83-10 (US EPA method 8310) | Sediments, waste |
| 32 ¹ | Determination of volatile organic compounds by headspace/GC/MS method | SOP no. OOA-38-10 (Manual to CTC CombiPal, US EPA method 3810) ⁵⁾ | Sediments, waste |

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| Ordinal number ¹ | Test procedure/method name | Test procedure/method identification ² | Tested object |
|-----------------------------|--|---|---|
| 33 ² | Determination of polycondensed aromatic hydrocarbons by HPLC/PDA/FLD method | SOP No. OOA-83-10C (US EPA method 8310, US EPA TO 13) | Rinse solutions, filters and solid sorbents from the measurements of emissions, immissions and working environment |
| 34 ² | Determination of volatile organic compounds by gas chromatography method (GC/MS) | SOP No. OOA-82-41C (US EPA method 8240, Manual to Perkin Elmer Thermal Desorber) | Solid sorbents from the measurements of emissions, immissions and working environment |
| 35 ² | Determination of hydrocarbons by gas chromatography method (FID) | SOP No. OOA-80-15C (US EPA metoda 8015C, ČSN EN 14039) | Filters and solid sorbents from the measurements of emissions, immissions and working environment |
| 36 ² | Determination of anions by ion chromatography with conductivity detection | SOP č. IET-IC-01 (ČSN EN ISO 10304-1, ČSN EN ISO 10304-3, Application sheets Institute Fondazione Salvatore Maugeri) | Waste water, surface water, aqueous solutions and extracts, absorption solutions, extracts from sorption tubes for sampling - emissions, immissions |

¹ asterisk at the ordinal number identifies the tests, which the Laboratory is qualified to carry out outside the permanent laboratory premises

² if the document identifying the test procedure is dated, only these specific procedures are used. If the document identifying the test procedure is not dated, the latest edition of the specified procedure is used (including any changes)

Superscript at the test ordinal number identifies the number of the location carrying out the test.

Annex:

Flexible scope of accreditation

| Ordinal number of tests |
|--|
| <i>12-15,17-20, 24, 25, 27,29, 31-36</i> |

The laboratory is allowed to modify the test methods listed in the Annex within the specified scope of accreditation provided the measuring principle is observed. The flexible approach to the scope of accreditation cannot be applied to the tests not included in the Annex.

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Abbreviations and explanations:

| | |
|-------------|--|
| AAS | atomic absorption spectrometry |
| AMA | atomic absorption spectrometry for Hg determination |
| CNT | Nanotechnology Centre |
| Emissions | Waste gas containing pollutants released in a controlled manner or leaking into atmosphere from pollution sources |
| FD, FLD | fluorescence detector |
| FID | flame ionization detector |
| GC/MS | gas chromatography with mass spectrometry detection |
| HPLC | high performance liquid chromatography |
| ICP-AES | inductively coupled plasma atomic emission spectroscopy |
| IET | Institute of Environmental Technologies |
| Immissions | Sampling of outdoor air |
| Waste | solid and liquid waste |
| PCB | polychlorinated biphenyls |
| PDA | photodiode array detector |
| SOP | standard operation procedure, internal procedure drawn up on the basis of standardized methods, legislative requirements and manuals to the devices used |
| Solid fuels | for SOP No. 3, 7, 24, 25, 26, solid fuels include black coal, brown coal and coke; for SOP No. 1, 16 and 19, solid fuels include biofuel, waste and/or fossil fuel |
| US EPA | United States Environmental Protection Agency |
| Extracts | aqueous extracts of waste and solid samples, extracts of materials |
| XFRS | X-ray fluorescence spectrometry |

Additional explanations to SOP:

Listed methods were also drawn up using the following documents:

- 3) The SOLAAR Series Cookbook, AAS ATI Unicam,
US EPA methods, SW 846, Vol.1, Section A, chapter 3.
Kraťovská, E., Kuss H.M. Rozklady v analytickej chemii, VIENALA Košice, 2001.
- 4) WANG, J.; NAKAZATO, T.; SAKANISHI, K.; YAMADA, O.; SAITO, I. Microwave digestion with HNO₃/H₂O₂ mixture at high temperatures for determination of trace elements in coal by ICP-OES and ICP-MS. Analytica Chimica Acta. 2004, s. 115-124.
WANG, J.; NAKAZATO, T.; SAKANISHI, K.; YAMADA, O.; TAO, H.; SAITO, I. Single-step microwave digestion with HNO₃ alone for determination of trace elements in coal by ICP spectrometry. Talanta. 2006, 5. ed., s. 1584-1590.
- 5) Manuals to CTC CombiPal Headspace US EPA methods, SW 846, Vol.1 Section B, Chapter 4.

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Range of determined parameters:

| Ord. number | Test procedure/method name – range of parameters |
|-------------|--|
| 7 | Determination of total sulphur by gravimetry and determination of specific sulphur by calculation The calculation of specific sulphur applies to solid fuels only |
| 19 | Determination of Na, Mg, Al, Si, P, S, K, Ca, Ti, Fe, Mn, Cl, V, Cr, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Ag, Cd, In, Sn, Sb, Te, I, Cs, Ba, La, Ce, Ta, W, Hg, Tl, Pb, Bi, Th and U by XRFS method Expressed in the form of listed elements or in the form of oxides: Na ₂ O, MgO, Al ₂ O ₃ , SiO ₂ , P ₂ O ₅ , SO ₃ , K ₂ O, CaO, TiO ₂ , MnO, Fe ₂ O ₃ , BaO, SrO |
| 26 | Determination of sulphur and halogens by combustion after decomposition in calorimetric reactor using ion chromatography with conductivity detection Fluorine, chlorine, bromine, combustible sulphur |
| 27 | Determination of anions by ion chromatography with conductivity detection Fluorides F ⁻ , chlorides Cl ⁻ , nitrites NO ₂ ⁻ , bromides Br ⁻ , nitrates NO ₃ ⁻ , phosphates PO ₄ ³⁻ , sulphates SO ₄ ²⁻ |
| 29 | Determination of PCB by gas chromatography method (GC/MS) Congeners 28,52,101,118,138,153,180 |
| 31 | Determination of polycondensed aromatic hydrocarbons by HPLC/PDA/FD method Naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[ah]anthracene, benzo[ghi]perylene |
| 32 | Determination of volatile organic compounds by headspace/GC/MS method Benzene, toluene, ethylbenzene, xylenes, chloroform, trichloroethene, tetrachloroethene |
| 33 | Determination of polycondensed aromatic hydrocarbons by HPLC/PDA/FD method Naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[ah]anthracene, benzo[ghi]perylene |
| 34 | Determination of volatile organic compounds by gas chromatography method (GC/MS) Benzene, tetrachloromethane, trichloromethane, chloroform, cis-1,2-dichloroethene, 1,1-dichloroethene, ethylbenzene, methylchloride, styrene, 1,1,2,2-tetrachloroethane, tetrachloroethene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, xylenes |
| 35 | Determination of hydrocarbons by gas chromatography with FID C ₁₀ -C ₄₀ , benzene, toluene, styrene, ethylbenzene, xylenes, trichlorethene, tetrachloroethene |

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| Ord. number | Test procedure/method name – range of parameters |
|----------------|--|
| 36 | Determination of anions by the method of ion chromatography with conductivity detection Fluorides F^- , chlorides Cl^- , bromides Br^- , nitrites NO_2^- , nitrates NO_3^- , phosphates PO_4^{3-} , sulphites SO_3^{2-} , sulphates SO_4^{2-} In the case of immissions expressed in the form of the listed anions or in the form of oxides: NO_2 , SO_2 . |