

Potvrda o akreditaciji Accreditation Certificate

Ovime se utvrđuje da je
This is to recognize that

Državni hidrometeorološki zavod
Ravnice 48, HR-10000 Zagreb
Služba kemijski laboratorij
Avenija V. Holjevca 20, HR-10000 Zagreb

osposobljen prema zahtjevima norme
is competent according to
HRN EN ISO/IEC 17025:2017
(ISO/IEC 17025:2017;
EN ISO/IEC 17025:2017)
za/to carry out

Ispitivanje oborine i vanjskog zraka
Testing of precipitation and ambient air

u području opisanom u prilogu koji je sastavni dio ove potvrde o akreditaciji.
for the scope described in the annex which is the constituent part of this accreditation certificate.

Br./No.: 1427
Klasa/Ref.No.: 383-02/23-30/004
Urbroj/Id.No.: 569-05/3-23-52
Zagreb, 2023-07-24

Akreditacija istječe·Accreditation expiry: 2028-07-23
Prva akreditacija·Initial accreditation: 2013-07-24

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HAA is a signatory of the European co-operation for Accreditation (EA) Multilateral Agreement

Ravnateljica:
Director General:
mr. sc. Mirela Zečević


HAA-Ob-7/7-1/izdanje/Issue 6



Hrvatska akreditacijska agencija
Croatian Accreditation Agency



PRILOG POTVRDI O AKREDITACIJI br: 1427

Annex to Accreditation Certificate Number:

Klasa/Ref. No.: 383-02/23-30/004

Urbroj/Id. No.: 569-05/3-23-51

Datum izdanja priloga /Annex Issued on: 2023-07-24

Klasa/Ref. No.: 383-02/17-30/063

Urbroj/Id. No.: 569-05/3-22-12

Datum izdanja priloga /Annex Issued on: 2022-03-31

Norma: HRN EN ISO/IEC 17025:2017

Standard: (ISO/IEC 17025:2017; EN ISO/IEC 17025:2017)

Akreditacija istječe: 2028-07-23

Accreditation expiry:

Prva akreditacija: 2013-07-24

Initial accreditation:

Akreditirani laboratorij

Accredited Laboratory

Državni hidrometeorološki zavod

Ravnice 48, HR-10000 Zagreb

Služba kemijski laboratorij

Avenija V. Holjevca 20, HR-10000 Zagreb

Područje akreditacije:

Scope of Accreditation:

Ispitivanje oborine i vanjskog zraka

Testing of precipitation and ambient air

Važeće izdanje Priloga dostupno je na web adresi: www.akreditacija.hr /
Valid issue of the Annex is available at the web address: www.akreditacija.hr

Ravnateljica:

Director General:

mr. sc. Mirela Zečević


PODRUČJE AKREDITACIJE / SCOPE OF ACCREDITATION

| Br. No. | Materijali/Proizvodi Materials/Products | Vrsta ispitivanja/Svojstvo Type of test/Property Raspon/Range | Metoda ispitivanja Test method | | | | | | | | | | | | | | | | | | |
|----------------------------------|---|---|-----------------------------------|----------------------------|-----------------|----------------|---------------------------------|----------------|----------------------------------|----------------|-----------------|----------------|---------------------------------|----------------|----------------|----------------|------------------|----------------|------------------|----------------|--|
| 1. | Oborina Precipitation | <p>Određivanje otopljenih glavnih iona u oborini ionskom kromatografijom <i>Determination of main ion concentrations by ion chromatography</i></p> <p>raspon/range:</p> <table border="1"> <thead> <tr> <th>analit/analyte</th> <th>c / (mg mL⁻¹)</th> </tr> </thead> <tbody> <tr> <td>Cl⁻</td> <td>0,0500 – 100</td> </tr> <tr> <td>NO₃⁻-N</td> <td>0,0565 – 10,0</td> </tr> <tr> <td>SO₄²⁻-S</td> <td>0,0501 – 10,0</td> </tr> <tr> <td>Na⁺</td> <td>0,0500 – 100</td> </tr> <tr> <td>NH₄⁺-N</td> <td>0,0389 – 7,00</td> </tr> <tr> <td>K⁺</td> <td>0,0500 – 10,0</td> </tr> <tr> <td>Mg²⁺</td> <td>0,0500 – 8,00</td> </tr> <tr> <td>Ca²⁺</td> <td>0,0500 – 20,0</td> </tr> </tbody> </table> | analit/analyte | c / (mg mL ⁻¹) | Cl ⁻ | 0,0500 – 100 | NO ₃ ⁻ -N | 0,0565 – 10,0 | SO ₄ ²⁻ -S | 0,0501 – 10,0 | Na ⁺ | 0,0500 – 100 | NH ₄ ⁺ -N | 0,0389 – 7,00 | K ⁺ | 0,0500 – 10,0 | Mg ²⁺ | 0,0500 – 8,00 | Ca ²⁺ | 0,0500 – 20,0 | <p>HRN EN ISO 10304-1:2009 (ISO 10304-1:2007; EN ISO 10304-1:2009) HRN EN ISO 14911:2001 (ISO 14911:1998; EN ISO 14911:1999)</p> |
| analit/analyte | c / (mg mL ⁻¹) | | | | | | | | | | | | | | | | | | | | |
| Cl ⁻ | 0,0500 – 100 | | | | | | | | | | | | | | | | | | | | |
| NO ₃ ⁻ -N | 0,0565 – 10,0 | | | | | | | | | | | | | | | | | | | | |
| SO ₄ ²⁻ -S | 0,0501 – 10,0 | | | | | | | | | | | | | | | | | | | | |
| Na ⁺ | 0,0500 – 100 | | | | | | | | | | | | | | | | | | | | |
| NH ₄ ⁺ -N | 0,0389 – 7,00 | | | | | | | | | | | | | | | | | | | | |
| K ⁺ | 0,0500 – 10,0 | | | | | | | | | | | | | | | | | | | | |
| Mg ²⁺ | 0,0500 – 8,00 | | | | | | | | | | | | | | | | | | | | |
| Ca ²⁺ | 0,0500 – 20,0 | | | | | | | | | | | | | | | | | | | | |
| 2. | Vanjski zrak- lebdeće čestice (PM _{2,5}) Ambient air-suspended particulate matter (PM _{2,5}) | <p>Određivanje glavnih iona u frakciji lebdećih čestica PM_{2,5} ionskom kromatografijom <i>Determination of main ion concentrations in PM_{2,5} particle fraction by ion chromatography</i></p> <p>raspon/range:</p> <table border="1"> <thead> <tr> <th>analit/analyte</th> <th>c / (µg m⁻³)</th> </tr> </thead> <tbody> <tr> <td>Cl⁻</td> <td>0,00909 – 1,82</td> </tr> <tr> <td>NO₃⁻</td> <td>0,0456 – 24,14</td> </tr> <tr> <td>SO₄²⁻</td> <td>0,0272 – 16,33</td> </tr> <tr> <td>Na⁺</td> <td>0,00545 – 1,82</td> </tr> <tr> <td>NH₄⁺</td> <td>0,00545 – 7,03</td> </tr> <tr> <td>K⁺</td> <td>0,00545 – 1,82</td> </tr> <tr> <td>Mg²⁺</td> <td>0,00545 – 1,82</td> </tr> <tr> <td>Ca²⁺</td> <td>0,00545 – 1,82</td> </tr> </tbody> </table> | analit/analyte | c / (µg m ⁻³) | Cl ⁻ | 0,00909 – 1,82 | NO ₃ ⁻ | 0,0456 – 24,14 | SO ₄ ²⁻ | 0,0272 – 16,33 | Na ⁺ | 0,00545 – 1,82 | NH ₄ ⁺ | 0,00545 – 7,03 | K ⁺ | 0,00545 – 1,82 | Mg ²⁺ | 0,00545 – 1,82 | Ca ²⁺ | 0,00545 – 1,82 | <p>HRI CEN/TR 16269:2017 (CEN/TR 16269:2011)</p> |
| analit/analyte | c / (µg m ⁻³) | | | | | | | | | | | | | | | | | | | | |
| Cl ⁻ | 0,00909 – 1,82 | | | | | | | | | | | | | | | | | | | | |
| NO ₃ ⁻ | 0,0456 – 24,14 | | | | | | | | | | | | | | | | | | | | |
| SO ₄ ²⁻ | 0,0272 – 16,33 | | | | | | | | | | | | | | | | | | | | |
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| NH ₄ ⁺ | 0,00545 – 7,03 | | | | | | | | | | | | | | | | | | | | |
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| Br. No. | Materijali/Proizvodi Materials/Products | Vrsta ispitivanja/Svojstvo Type of test/Property Raspon/Range | Metoda ispitivanja Test method | | | | | | | | | | | | | | |
|---|--|--|--|---------------------------|--|-------------|---------------------------|------------|---|-------------|--|-------------|--|-------------|--|-------------|---|
| 3. | | <p>Određivanje koncentracije benzo(a)pirena metodom plinske kromatografije vezane na spektrometriju masa (GC-MS) <i>Determination of benzo(a)pyrene concentration by gas chromatography linked to mass spectrometry (GC-MS)</i></p> <p>raspon/ range: 0,03 ng m⁻³ – 1,53 ng m⁻³</p> | <p>HRN EN 15549:2008 (EN 15549:2008)</p> | | | | | | | | | | | | | | |
| 4. | <p>Vanjski zrak- lebdeće čestice (PM₁₀) <i>Ambient air-suspended particulate matter (PM₁₀)</i></p> | <p>Određivanje koncentracije benzo[a]antracena, krizena, benzo[b+j+k]fluorantena, dibenzo[a,h]antracena, indeno[1,2,3-cd]pirena i benzo[g,h,i]perilena metodom plinske kromatografije vezane na spektrometriju masa (GC-MS) <i>Determination of concentration of benz[a]anthracene, chrysene, benzo[b+j+k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene and benzo[ghi]perylene by gas chromatography linked to mass spectrometry (GC-MS)</i></p> <p>raspon/range:</p> <table border="1"> <thead> <tr> <th>Analit/Analyte</th> <th>c / (ng m⁻³)</th> </tr> </thead> <tbody> <tr> <td>benzo(a)antracen <i>benz[a]anthracene</i></td> <td>0,05 – 1,53</td> </tr> <tr> <td>krizen <i>chrysene</i></td> <td>0,05– 1,56</td> </tr> <tr> <td>benzo(b+j+k)fluoranten <i>benzo[b+j+k]fluoranthene</i></td> <td>0,06 – 7,65</td> </tr> <tr> <td>dibenzo(a,h)antracen <i>dibenz[a,h]anthracene</i></td> <td>0,03 – 3,15</td> </tr> <tr> <td>indeno(1,2,3-cd)piren <i>indeno[1,2,3-cd]pyrene</i></td> <td>0,04 – 1,55</td> </tr> <tr> <td>benzo(g,h,i)perilen <i>benzo[ghi]perylene</i></td> <td>0,05 – 2,93</td> </tr> </tbody> </table> | Analit/Analyte | c / (ng m ⁻³) | benzo(a)antracen <i>benz[a]anthracene</i> | 0,05 – 1,53 | krizen <i>chrysene</i> | 0,05– 1,56 | benzo(b+j+k)fluoranten <i>benzo[b+j+k]fluoranthene</i> | 0,06 – 7,65 | dibenzo(a,h)antracen <i>dibenz[a,h]anthracene</i> | 0,03 – 3,15 | indeno(1,2,3-cd)piren <i>indeno[1,2,3-cd]pyrene</i> | 0,04 – 1,55 | benzo(g,h,i)perilen <i>benzo[ghi]perylene</i> | 0,05 – 2,93 | <p>HRS CEN/TS 16645:2016 (CEN/TS 16645:2014)</p> <p>PO-7.2.3, rev. 3 2021-12-15</p> |
| Analit/Analyte | c / (ng m ⁻³) | | | | | | | | | | | | | | | | |
| benzo(a)antracen <i>benz[a]anthracene</i> | 0,05 – 1,53 | | | | | | | | | | | | | | | | |
| krizen <i>chrysene</i> | 0,05– 1,56 | | | | | | | | | | | | | | | | |
| benzo(b+j+k)fluoranten <i>benzo[b+j+k]fluoranthene</i> | 0,06 – 7,65 | | | | | | | | | | | | | | | | |
| dibenzo(a,h)antracen <i>dibenz[a,h]anthracene</i> | 0,03 – 3,15 | | | | | | | | | | | | | | | | |
| indeno(1,2,3-cd)piren <i>indeno[1,2,3-cd]pyrene</i> | 0,04 – 1,55 | | | | | | | | | | | | | | | | |
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| Br. No. | Materijali/Proizvodi Materials/Products | Vrsta ispitivanja/Svojstvo Type of test/Property Raspon/Range | Metoda ispitivanja Test method | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--------------------------------------|--|--|----------------|--------------------|----------------|---|----------------|---|----------------|---|----------------|--|----------------|--|----------------|--|----------------|--|----------------|--------------------------------------|
| 5. | Vanjski zrak Ambient air | <p>Određivanje masene koncentracije PM₁₀ i PM_{2,5} frakcije lebdećih čestica <i>Determination of mass concentration of PM₁₀ and PM_{2,5} particle fraction</i></p> <p>raspon/range:</p> <p>PM₁₀: 1 – 150 µg m⁻³ PM_{2,5}: 1 – 120 µg m⁻³</p> | HRN EN 12341:2014 (EN 12341:2014) | | | | | | | | | | | | | | | | | | | | |
| 6. | Oborina Precipitation | <p>Određivanje policikličkih aromatskih ugljikovodika u oborini metodom plinske kromatografije (GC-MS/MS) <i>Determination of the deposition of polycyclic aromatic hydrocarbons concentration by gas chromatography linked to mass spectrometry (GC-MSMS)</i></p> <table border="1"> <thead> <tr> <th>Analit/Analyte</th> <th>Raspon / Range depozicija (ng m⁻² d⁻¹)</th> </tr> </thead> <tbody> <tr> <td>benzo[a]antracen <i>benz[a]anthracene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>krizen chrysene</td> <td>14,56 – 582,35</td> </tr> <tr> <td>benzo[b]fluoranten <i>benzo[b]fluoranthene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>benzo[k]fluoranten <i>benzo[k]fluoranthene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>benzo[j]fluoranten <i>benzo[j]fluoranthene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>benzo[a]piren <i>benzo[a]pyrene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i></td> <td>14,56 – 582,35</td> </tr> <tr> <td>benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i></td> <td>14,56 – 582,35</td> </tr> </tbody> </table> | Analit/Analyte | Raspon / Range depozicija (ng m ⁻² d ⁻¹) | benzo[a]antracen <i>benz[a]anthracene</i> | 14,56 – 582,35 | krizen chrysene | 14,56 – 582,35 | benzo[b]fluoranten <i>benzo[b]fluoranthene</i> | 14,56 – 582,35 | benzo[k]fluoranten <i>benzo[k]fluoranthene</i> | 14,56 – 582,35 | benzo[j]fluoranten <i>benzo[j]fluoranthene</i> | 14,56 – 582,35 | benzo[a]piren <i>benzo[a]pyrene</i> | 14,56 – 582,35 | indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i> | 14,56 – 582,35 | dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i> | 14,56 – 582,35 | benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i> | 14,56 – 582,35 | HRN EN 15980:2011 (EN 15980:2011) |
| Analit/Analyte | Raspon / Range depozicija (ng m ⁻² d ⁻¹) | | | | | | | | | | | | | | | | | | | | | | |
| benzo[a]antracen <i>benz[a]anthracene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| krizen chrysene | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[b]fluoranten <i>benzo[b]fluoranthene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[k]fluoranten <i>benzo[k]fluoranthene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[j]fluoranten <i>benzo[j]fluoranthene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[a]piren <i>benzo[a]pyrene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i> | 14,56 – 582,35 | | | | | | | | | | | | | | | | | | | | | | |

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|--|--|--|---|--|--|-------------|---------------------------|-------------|---|-------------|---|-------------|---|-------------|--|-------------|--|-------------|--|-------------|--|-------------|---|
| 7. | Vanjski zrak- plinovita faza i lebdeće čestice <i>Ambient air- gas and particle phase</i> | <p>Određivanje policikličkih aromatskih ugljikovodika u zraku metodom plinske kromatografije (GC-MS/MS) <i>Determination of total polycyclic aromatic hydrocarbons-collection in air with gas chromatographic/mass spectrometric analyses (GC-MSMS)</i></p> <table border="1"> <thead> <tr> <th>Analit/Analyte</th> <th>Raspon / Range <i>c</i> (ng m⁻³)</th> </tr> </thead> <tbody> <tr> <td>benzo[a]antracen <i>benz[a]anthracene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>krizen <i>chrysene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>benzo[b]fluoranten <i>benzo[b]fluoranthene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>benzo[k]fluoranten <i>benzo[k]fluoranthene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>benzo[j]fluoranten <i>benzo[j]fluoranthene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>benzo[a]piren <i>benzo[a]pyrene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i></td> <td>0,08 – 0,42</td> </tr> <tr> <td>benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i></td> <td>0,08 – 0,42</td> </tr> </tbody> </table> | Analit/Analyte | Raspon / Range <i>c</i> (ng m ⁻³) | benzo[a]antracen <i>benz[a]anthracene</i> | 0,08 – 0,42 | krizen <i>chrysene</i> | 0,08 – 0,42 | benzo[b]fluoranten <i>benzo[b]fluoranthene</i> | 0,08 – 0,42 | benzo[k]fluoranten <i>benzo[k]fluoranthene</i> | 0,08 – 0,42 | benzo[j]fluoranten <i>benzo[j]fluoranthene</i> | 0,08 – 0,42 | benzo[a]piren <i>benzo[a]pyrene</i> | 0,08 – 0,42 | indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i> | 0,08 – 0,42 | dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i> | 0,08 – 0,42 | benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i> | 0,08 – 0,42 | <p>PO-7.2.6, rev. 0 2023-01-05</p> <p>modificirana/ <i>modified</i> HRN ISO 12884:2008 (ISO 12884:2000)</p> |
| Analit/Analyte | Raspon / Range <i>c</i> (ng m ⁻³) | | | | | | | | | | | | | | | | | | | | | | |
| benzo[a]antracen <i>benz[a]anthracene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| krizen <i>chrysene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[b]fluoranten <i>benzo[b]fluoranthene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[k]fluoranten <i>benzo[k]fluoranthene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[j]fluoranten <i>benzo[j]fluoranthene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[a]piren <i>benzo[a]pyrene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| indeno[1,2,3-cd]piren <i>indeno[1,2,3-cd]pyrene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| dibenzo[a,h]antracen <i>dibenz[a,h]anthracene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| benzo[g,h,i]perilen <i>benzo[g,h,i]perylene</i> | 0,08 – 0,42 | | | | | | | | | | | | | | | | | | | | | | |
| 8. | Vanjski zrak <i>Ambient air</i> | <p>Određivanje ukupne taložne tvari (UTT) prema Bergerhoff metodi <i>Determination of the dust deposition according to the Bergerhoff method</i></p> <p>Granica kvantifikacije/<i>Quantification limit</i> 4,6 mg m⁻² d⁻¹</p> | <p>VDI 4320 Part 2:2012</p>  | | | | | | | | | | | | | | | | | | | | |

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|---------|--|---|--|
| 9. | Vanjski zrak Ambient air | <p>Određivanje arsena, kadmija, olova i nikla u taložnoj tvari primjenom induktivno spregnute plazme sa spektrometrijom masa <i>Determination of arsenic, cadmium, lead and nickel in atmospheric deposition by inductively coupled plasma with mass spectrometry</i></p> <p>Granica kvantifikacije/<i>Quantification limit</i> As: 0,03 $\mu\text{g m}^{-2} \text{d}^{-1}$ Cd: 0,06 $\mu\text{g m}^{-2} \text{d}^{-1}$ Pb: 0,49 $\mu\text{g m}^{-2} \text{d}^{-1}$ Ni: 0,08 $\mu\text{g m}^{-2} \text{d}^{-1}$</p> | HRN EN 15841:2010 (EN 15841:2009) |