



Recently finalised and on-going CRM projects in the field of environment

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Joint
Research
Centre

Certified Reference Materials (CRMs)

CRMs are measurement standards

- identity determination
- calibration
- method development
- method validation
- quality control (charts)

REFERENCE MATERIAL CERTIFICATE

ERM®- CE100

FISH TISSUE

Certified Values		
Mass Fraction (relative to wet weight)		
	Certified value ⁵⁾ [µg/kg]	Uncertainty ⁶⁾ [µg/kg]
Hexachlorobenzene ¹⁾	120	8
Hexachlorobutadiene ¹⁾	36	4
Short-chain chlorinated paraffins (SCCPs) ²⁾	31	9
Short-chain chlorinated paraffins (SCCPs) ³⁾	23	7
Medium-chain chlorinated paraffins (MCCPs) ⁴⁾	44	17
<small>1) as obtained by gas chromatography 2) sum of SCCPs C₁₀₋₁₃Cl₄₋₁₂ as obtained by mass spectrometry. The certified value and its uncertainty are traceable to the calibrants used i.e., "chloroparaffin C10-C13" and "chloroparaffin C10, C11, C12, C13" by Dr. Ehrenstorfer/LGC. 3) sum of SCCPs C₁₀₋₁₃Cl₄₋₁₂ as obtained by mass spectrometry using calibrant CLF-5248 by Chiron AS (mixture of 1,2,5,6,9,10-hexachlorodecane, 1,2,4,5,8,9-hexachloroundecane, 1,2,5,6,9,10-hexachlorododecane, 1,2,6,7,10,11-hexachlorotridecane and 2,3,6,7,10,11-hexachlorotridecane in approximate ratio 4:13:13:35:35). The certified value and its uncertainty are traceable to the International System of Units (SI). 4) sum of MCCPs C₁₄₋₁₇Cl₄₋₁₀ as obtained by mass spectrometry. The certified value and its uncertainty are traceable to the calibrants used i.e., "chloroparaffin C14-C17" by Dr. Ehrenstorfer/LGC. 5) Certified values are values that fulfil the highest standards of accuracy. The given values represent the unweighted mean value of the means of accepted sets of data, each set being obtained in a different laboratory and/or with a different method of determination. 6) The uncertainty of the certified values is the expanded uncertainty with a coverage factor $k = 2$ corresponding to a level of confidence of about 95 % estimated in accordance with ISO 17034:2016 and ISO Guide 35:2017.</small>		



Reference Materials for EU policies

Food and feed safety

Health diagnostics

**Nanotechnologies and industrial
applications**

Environmental monitoring



European legislation supported by JRC CRMs

Water Framework
Directive (WFD)
2000/60/EC

Water Priority
Substances
Directive 2013/39/EU

QA/QC Directive
2009/90/EC

Groundwater
Directive
2006/118/EC

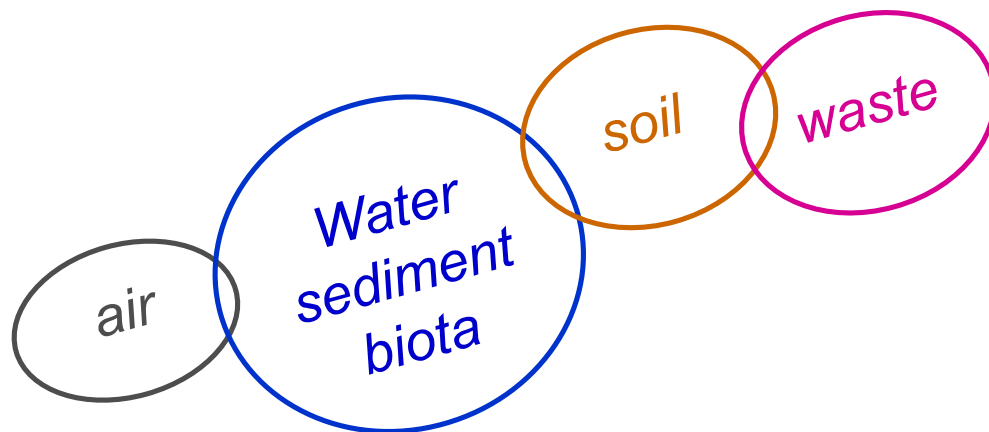
Ambient air quality
Directive
2008/50/EC

Marine Strategy
Framework Directive
2008/56/EC

Thematic Strategy
for Soil Protection
SEC(2006)620
SEC(2006)1165

RoHS Directive
2011/65/EU

POPs Regulation
2019/1021



Recently released environmental CRMs (2020)

- **ERM-CZ110 – fine dust (PM_{2.5}-like) – water soluble ions**

CRM simulating the finest fraction of airborne particulate matter

PM_{2.5} can penetrate deep into the lungs and may pass into the bloodstream causing respiratory problems and premature death

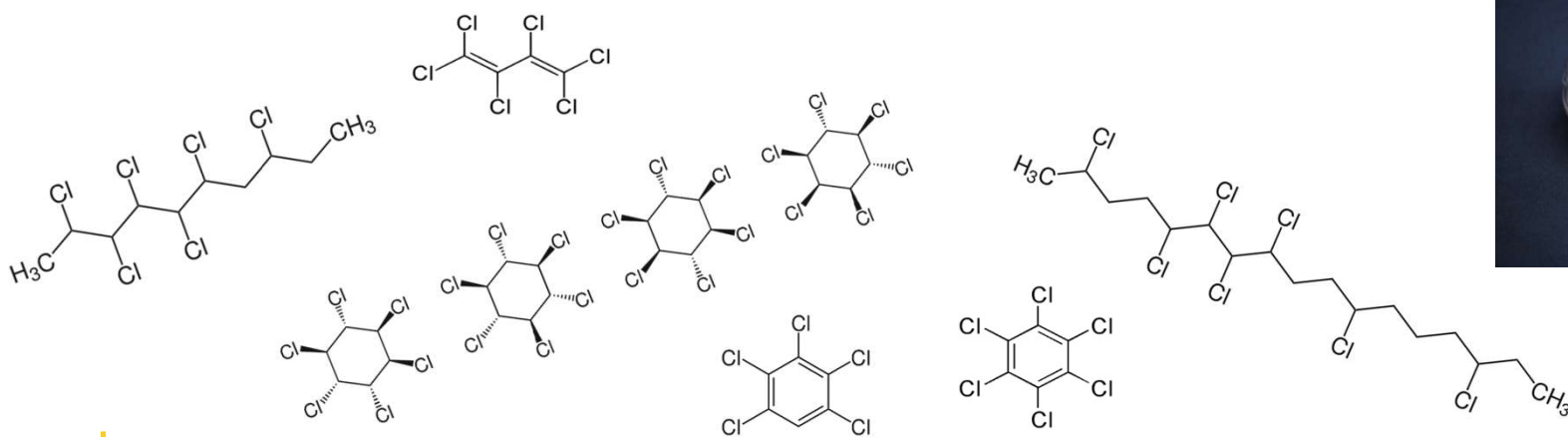
The Ambient Air Quality Directive requires EU Member States to make measurements on the chemical composition of PM_{2.5}



Water-soluble ions certified in ERM-CZ110: Na⁺, K⁺, Ca²⁺, Mg²⁺, Cl⁻, NO₃⁻ and SO₄²⁻ (indicative value for NH₄⁺)

Recently released environmental CRMs (2022-2023)

- **ERM-CE100 – fish tissue – Short-Chain and Medium-Chain Chlorinated Paraffins (SCCPs and MCCPs), added to hexachlorobenzene (HCB) and hexachlorobutadiene (HCBD)**
- **ERM-CE103 - fish tissue – pentachlorobenzene (PeCB) and hexachlorocyclohexanes (HCHs)**



Wet tissue biota CRMs

Most of the organohalogenated compounds certified in ERM-CE100 and ERM-CE103 are POPs and WFD PSs

WFD Environmental Quality Standards (EQS) are set in water for 45 PSs, 11 of those having also EQS in biota **wet weight** (e.g. HCB and HCBd)

Novel wet matrix, similar to baby food, that can be stored at + 4 °C



ERM-CE100 is the first matrix CRM available for chlorinated paraffins (CPs), produced in the frame of the Eurostars project CHLOFFIN

On-going environmental CRM projects

- PBDEs in whole water (containing suspended particulate matter)
- PM10-like dust material for PAHs and elements
- PET (polyethylene terephthalate) in water
- Feasibility study for antibiotics in (whole) water



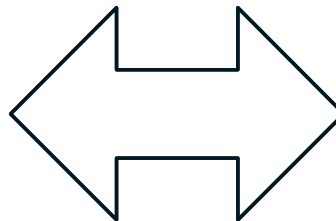
PBDEs in “whole” water

Everything started in 2011...

ENV08-EMRP

- WP5: “*Feasibility study for the preparation of reference materials*”
- “Whole” water RMs (SPM & humic acids)
- PAHs, PBDEs, TBT

Reference materials



Measurements

CEN TC230-M/424

- Standards for “whole” water analysis
EN 16691:2015 (PAHs)
CEN/TS 16692:2015 (TBT)
EN 16694:2015 (PBDEs)
- RMs for the interlaboratory comparison from ENV08

EMRP = European Metrology Research Programme: 2009-2013
CEN/TC 230 - Water analysis

CRM for PBDEs in whole water

- Target measurands: BDE28, 47, 99, 100, 153, 154
- Matrix: mineral water (1 L) + suspended particulate matter (SPM) (200 mg, top particle size: 12.5 µm)
- Pollutants adsorbed to the SPM (freshwater sediment)
- $SUM_{PBDEs} \sim 11 \text{ ng/L}$



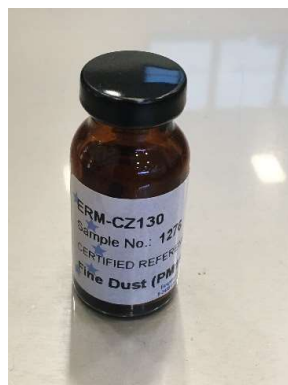
Water EQS : 0.14 ng/L (inland surface waters), 0.014 (other surface waters)

PM10-like CRM for PAHs and As, Cd, Ni, Pb

Re-make for exhausting stocks of PM₁₀ CRMs ERM-CZ100 (PAHs) and ERM-CZ110 (elements)

Air-sampling for collecting raw material is not practicable because of the high amount needed, alternatively collection and jet-milling of tunnel dust was performed

Project almost finalised



PET in water

Everything started in 2019...

Sample kit:

- PET immobilised in a NaCl-carrier
- Rinsing solution (0.1% Triton X in water)
- 1-L bottle water for reconstitution

Protocol for sample preparation

Target measurands:

mass concentration of PET (certified)

number concentration of PET particles (indicative)

Call for laboratories to participate in proficiency tests on microplastics in drinking water and sediments

JUL
08
2019

The JRC, together with the German Federal Institute for Materials Research and Testing (BAM), is launching a call for expert laboratories, to participate in the proficiency tests on specific microplastics in water (bottled water, drinking water) and polyethylene in sediments.



Call for laboratories to participate in proficiency tests on microplastics in drinking water and sediments
©EU, 2019



Feasibility study for antibiotics in water RM

European Union Strategic Approach to Pharmaceuticals in the Environment COM 2019 128

16/06/2023 Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach

1L mineral water, 100 mg SPM, ca. 100 µg/L antibiotics total

Selected antibiotics: amox~~x~~icillin (β-lactam), ciprofloxacin and levofloxacin (fluoroquinolones), erythromycin and clarithromycin (macrolides)

RM possible application also for effect-based methods (bioassays)

Issues with stability for some compounds

Next step: small PT with expert labs



EC-JRC Geel and reference materials

EC-JRC Geel is one of the major developers and producers of certified reference materials in the world (ISO 17034 accredited since 2004, first in Europe)

Portfolio: almost 750 different RMs and about 120 nuclear RMs

More information?

Reference material on-line catalogue: <https://crm.jrc.ec.europa.eu/>



Acknowledgments all colleagues in the Reference Materials Unit Thank you



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