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# Environmental CRMs

From Sigma-Aldrich

Safety in all environments he works in

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[sigma-aldrich.com/ecrm](http://sigma-aldrich.com/ecrm)

**SIGMA**

**ALDRICH**

**Fluka**

**SUPELCO**

**Cerilliant**

**RTC**

**SIGMA-ALDRICH**

# Introduction

Sigma-Aldrich offers a wide range of certified reference materials (CRMs). With RTC™, Fluka®, Supelco® and Cerilliant™ products, we offer four in-house manufactured CRM brands and certified in accordance to ISO Guide 34 and ISO/IEC 17025, considered the “Gold Standard” for the production of certified reference materials. Many accreditation bodies now require the use



of these doubly accredited certified reference materials, where they are available. Leveraging the global presence and distribution capabilities of Sigma-Aldrich has enhanced the reach and quality of service, solidifying our position as an industry leader in analytical standards and CRMs.

Each of our brands - RTC, Fluka and Supelco - offer a wide range of environmental CRMs as neat, matrix or standard mixes in solution. These include PAHs, pesticides, dioxins and other persistent organic pollutants. The Cerilliant brand focuses on CRM solutions for clinical/forensic, toxicology, diagnostic, and environmental testing laboratories, with a specific focus on pharmaceuticals, illicit drugs, and hormones.

We have an extensive and continuous program of new product development, with new environmental CRMs being continually developed and added to the range. If there is an environmental CRM that you would like to see added, please provide feedback to the Environmental Standards team at [rtc-eu@sial.com](mailto:rtc-eu@sial.com)

# Accreditation for CRMs

All our CRMs are accredited by either ACLASS or SAS, both of which are signatories to the ILAC - the International Laboratory Accreditation Cooperation. This means that the accreditation body has demonstrated that they conform to international standards and, as a result, the accreditation they grant to individual testing laboratories is recognised internationally. This allows testing laboratories to operate on a global basis.

# Environmental Matrix CRMs

Sigma-Aldrich RTC products are designed for the most demanding of environmental samples and are either “Real World” natural matrix CRMs, or natural matrices in which selected analytes have been fortified to give analytical profiles that meet the needs of the market. The range includes CRMs and Proficiency Testing (PT) Samples.

RTC is a world leader in the manufacture of real-world soil and sediment Certified Reference Materials. Development of this product line started over two decades ago: soils and solid wastes were collected from contaminated sites around the United States to produce real-world CRMs for the USEPA.

Working in close cooperation with regulatory agencies throughout the Americas, Asia and Europe, RTC continues to extend the portfolio of proficiency testing schemes and CRMs to meet the evolving needs of analytical laboratories around the world.

A robust statistical program is used in determining the certified values of RTC CRMs, utilising data collected from multi-laboratory analysis supported by in-house data. Most CRMs are method specific, and all are supplied with ISO Guide 31 compliant certificates. The certificates show the intended use, certified values and their corresponding uncertainties and traceability information.

	ISO/IEC 17025:2005	ISO Guide 34:2009	ISO/IEC 17043:2010	ISO/IEC 13485:2003
Buchs (Fluka), Switzerland	SAS accredited testing laboratory for chemical and physical analysis and certification of reference materials in accordance with the Standard ISO/IEC 17025 (cert# STS 490)	SAS accreditation to standard ISO Guide 34:2009 & ISO/IEC 17025:2005 Producer of certified reference materials (SAS Accreditation number SRMS 001)	—	SAS accredited ISO 13485:2003 Design and manufacture of certified reference materials, analytical reference standards, analytes and chemical reagents for use in the medical device industry (cert# 37921)
Bellefonte (Supelco), USA	ACLASS accredited ISO/IEC 17025:2005 Testing Laboratory (cert# AT-1607)	ACLASS accredited ISO Guide 34:2009 Reference Material Producer (cert# AR-1606)	—	—
Laramie (RTC), USA	ACLASS accredited ISO/IEC 17025:2005 Testing Laboratory (cert# AT-1467)	ACLASS accredited ISO Guide 34:2009 Reference Material Producer (cert# AR-1470)	ACLASS accredited ISO/IEC 17043:2010 Proficiency Testing Provider (cert# AP-1469)	—
Round Rock (Cerilliant), USA	ACLASS accredited ISO/IEC 17025:2005 Testing Laboratory (cert# AT-1352)	ACLASS accredited ISO Guide 34:2009 Reference Material Producer (cert# AR-1353)	—	UKAS accredited ISO 13485:2003 Design and manufacture of certified reference materials, analytical reference standards, analytes and chemical reagents for use in the medical device industry (cert# UQA 4001270)

# Matrix CRMs

## WATER

Whether your analysis is on drinking water, or contaminated water, Sigma-Aldrich can supply a wide variety of CRMs, covering inorganics and organics and physical properties, such as water hardness and colour. There are several products available as ready-to-use whole volume samples, or are offered as concentrates, which need to be diluted to a specific volume prior to use.

### Water CRMs

Matrix	Metals and Inorganics	Organics	Physical Properties
Water Supply (WS)	>35 products	>28 products	>18 products
Water Pollution (WP)	>29 products	>48 products	>20 products
Sea water	>3 products	>3 products	>5 products

For more information, visit [sigma-aldrich.com/ecrm](http://sigma-aldrich.com/ecrm)

### Water Hardness: Matrix Modifiers

Hardness	mg/L or ppm Calcium	mg/L or ppm Calcium Carbonate	Degrees Clarke (UK)	Degrees French	Degrees German	Degrees US	Milli Equivalents per Litre
Soft	<30	<75	<5.25	<75	<4.2	<4.5	<1.5
Moderately Hard	30-60	75-150	5.25-10.5	75-150	4.2-8.4	4.5-9	1.5-3
Hard	60-120	150-300	10.5-21	150-300	8.4-16.8	9.0-18	3-6
Very Hard	>120	>300	>21	>300	>16.8	>18	>6

Our series of matrix modifiers allows the matrix to be matched with local water characteristics. These specific water matrix modifiers can be used in conjunction with samples to assist labs in simulating the most realistic water sample they deal with every day.

The range of matrix modifiers will allow most existing PT and CRM products to be prepared so that the matrix can be set at any of the following levels:

- 100 mg/L CaCO<sub>3</sub> Moderately Hard Water
- 200 mg/L CaCO<sub>3</sub> Hard Water
- 400 mg/L CaCO<sub>3</sub> Very Hard Water

Additional matrix modifiers are also available:

- "Waste Water" to produce typical discharge water that is tinted and contains particulates
- "Salt Water" to replicate sea or estuarine waters

Waste Water can be used together with any of the hard water modifiers. In addition, waste and salt waters may be combined.

Each modifier is supplied as a concentrate; 10 mL of concentrate will prepare 1 L of matrix water that is then used to make up the chosen PT or CRM material. Standards are supplied with a data sheet indicating analytes that are incompatible with the matrix. They can be used in conjunction with the water CRM to give a more suitable sample.

## SOIL

Soil is a complex matrix, made up of several individual components, such as sand, silt and clay. Sigma-Aldrich supplies soil CRMs with a variety of organic and inorganic analytes spiked at certified levels and also offers many matrix CRMs that have a defined composition of sand, silt, clay and organic matter, as well as analytical contaminants. These products provide a more realistic sample for analysis, and more closely mirror the samples a laboratory might analyse.

### Soil CRMs (Generic soils with known levels of analytes)

	Metals and Inorganics	Organics	Physical Properties
Soil / Solid waste	>13 products	>49 products	>7 products

### Matrix CRMs (Soil with known sand, silt, clay and organic matter composition, and analytes)

	Metals and Inorganics	Organics	Physical Properties
Sandy Clay	✓	✓	✓
Loamy Sand	✓	✓	✓
Sandy Loam	✓	✓	✓
Sand	✓	✓	✓
Clay	✓	✓	✓
Sediment	✓	✓	—
Soil	✓	✓	—
Sandy Clay Loam	—	✓	—
Silty Clay	✓	✓	—
Loamy Clay	✓	✓	—
Clay Loam	✓	✓	—
Silty Loam	✓	✓	—
Loam	✓	✓	—
Clean Soil	✓	✓	✓
Other Matrices*	✓	✓	—

\*Other matrices include Fly Ash, (sewage) Sludge, Dusts and Paints. NB Paints are dry powders, and primarily certified for lead

For more information, visit [sigma-aldrich.com/ecrm](http://sigma-aldrich.com/ecrm)

## XRF OF SOIL MATRICES

In most cases for rocks, ores, sediments and minerals, the sample is totally destroyed, either by grinding it to a fine powder, or boiling the sample in aqua regia, totally dissolving all the sample components. This resultant sample is then analysed directly.

XRF, however, is a relatively non-destructive technique, leaving the sample intact for other tests.

Matrix	Metals and Inorganics					
	Low level		Medium level		High level	
	As, Co, Hg, Zn	Cd, Cr, Pb, Ni	As, Co, Hg, Zn	Cd, Cr, Pb, Ni	As, Co, Hg, Zn	Cd, Cr, Pb, Ni
SiO <sub>2</sub>	✓	✓	✓	✓	✓	✓
Clay	✓	✓	✓	✓	✓	✓
Loam	✓	✓	✓	✓	✓	✓
Loamy Clay	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓
Sandy Loam	✓	✓	✓	✓	✓	✓

Different levels of metals in a silicon dioxide matrix for calibration purposes are also available. Examples are:

XRFOX03 Chromium XRF Standard - 13.68 wt%  
 XRFOX24 Chromium XRF Standard - 1.67 wt%  
 XRFOX46 Vanadium XRF Standard - 0.61 wt%  
 XRFOX53 Vanadium XRF Standard - 25.0 wt%  
 XRFOX26 Iron XRF Standard - 0.69 wt%  
 XRFOX05 Iron XRF Standard - 6.36 wt%

Full details of all the products can be found at [sigma-aldrich.com/xrf-crm](http://sigma-aldrich.com/xrf-crm)



# Neat and Solution Environmental CRMs

## TraceCERT®

TraceCERT® CRMs are developed and produced in an ISO/IEC 17025 and ISO Guide 34 accredited laboratory. Fluka TraceCERT® products are neat compounds, whereas Supelco TraceCERT® products include solutions and mixes.

The Fluka neat CRMs are uniquely certified by quantitative NMR (qNMR) and are directly traceable to NIST Standard Reference Material®.

The portfolio comprises pesticides, polyaromatic hydrocarbons, plasticizers and REACH regulated SVHC products amongst others.

As this product range is always expanding, for more information and the latest product listing, please visit [sigma-aldrich.com/organiccrm](http://sigma-aldrich.com/organiccrm)



# Matrix CRMs from other sources

## IRMM

Since April 2000, Sigma-Aldrich has been an Authorized Distributor of the Institute for Reference Materials and Measurements (IRMM) at Geel, Belgium. IRMM is one of the seven institutes of the Joint Research Centre (JRC), a Directorate-General of the European Commission (EC) for the support of EU policies. Their related environmental products cover the areas of

- Environmental Sciences
- Food and Agriculture
- Genetically Modified Organisms (GMO)
- Industrial Raw Materials
- Occupational Hygiene
- Physical Properties
- Reactor Neutron Dosimetry

As a result, customers can receive over 600 CRMs (BCR®) via the same Sigma-Aldrich distribution channels as all other environmental CRMs.



IRMM Production Hall for CRMs, © 2014 European Commission

Analytes	Neat Material (Fluka)	Solutions (Supelco)
Acids and Esters - (22 products)	✓	—
Air Monitoring - (45 products)	—	✓
Alcohols - (2 products)	✓	—
Aldehydes and Aldehyde Derivatives - (3 products)	✓	—
Antibiotics / Drugs - (6 products)	✓	—
Aromatics - (11 products)	✓	—
Biofuels - (1 product)	—	✓
EPA Drinking Water Methods/ Odor Standards - (12 products)	—	✓
EPA Solid Waste Methods - (19 products)	—	✓
EPA Waste Water Methods - (4 products)	—	✓
Hydrocarbons - (1 products)	✓	—

Analytes	Neat Material (Fluka)	Solutions (Supelco)
International Method Standards - (3 products)	—	✓
Pesticides - (14 products)	✓	—
Pesticides/Herbicides - (5 products)	—	✓
Phthalates - (7 products)	✓	—
Polyaromatic Hydrocarbons (PAHs) - (17 products)	✓	—
Substances of Very High Concern (SVHC) - (11 products)	✓	—
Underground Storage Tank (UST) - (4 products)	—	✓
Volatiles/Semi-Volatiles - (27 products)	—	✓

## Microorganism CRMs

Sigma-Aldrich offers CRMs for laboratories that perform microbiological testing. Known as Vitroids™, these microbiological CRM products are manufactured and certified in accordance to ISO Guide 34 and ISO/IEC 17025.

Sigma-Aldrich RTC's Vitroids technology minimizes the stress during the storage process, using a proprietary patented technology to stabilise bacterial and fungal organisms in a suspended state, with very minimal loss of viability. Unlike other microbiological standards, Vitroids offer:

1. Enhanced long term stability
2. High organism viability
3. No recovery or pre-incubation time

The result is that Vitroid microbiological standards are easier and faster to use, saving busy laboratory analyst's time. These products offer users enhanced flexibility and usability and are easily adaptable to any laboratory SOP in a wide variety of applications - Environmental, Pharmaceutical, Medical, Food and Water.

Many Vitroids (designated as RQC in product codes) are offered as CRMs under the American Type Culture Collection (ATCC®) Licensed-Derivative® program. The ATCC Licensed Derivative emblem signifies ATCC-derived products are endorsed by ATCC. Products displaying the emblem are the only ones for which the quality of the ATCC ingredient can be properly assured.

## Drugs in Waste Water

Illicit drugs and their metabolites along with household disposal of unwanted prescription drugs cause an increased workload for environmental laboratories. The impact of their presence on marine life in rivers and lakes, plus their potential incorporation into drinking water supplies, is a key concern for water supply companies. Cerilliant brand CRMs specialize in this key area and include a continually updating range of drugs of abuse in addition to male and female hormones, pharmaceuticals and metabolites. They are provided in a convenient, ready to use ampoule solution direct from local Sigma-Aldrich warehouses.

For the complete range, visit [sigma-aldrich.com/Cerilliant](http://sigma-aldrich.com/Cerilliant)

For any technical questions on Cerilliant products contact [CerilliantEU@sial.com](mailto:CerilliantEU@sial.com) for Europe  
[Custsv@cerilliant.com](mailto:Custsv@cerilliant.com) for U.S.

For more information, visit [sigma-aldrich.com/pharmastandards](http://sigma-aldrich.com/pharmastandards)



## Calibration CRMs

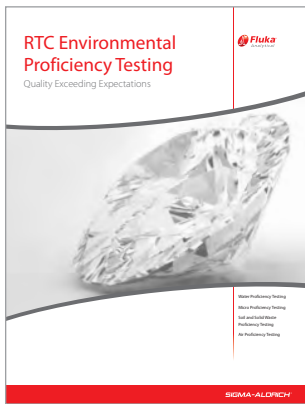
Sigma-Aldrich also provides a range of calibration CRMs including:

Metals and Inorganics		Organics		Physical Properties	
Ion Chromatography	Conductivity	Oil and Grease	Total Organic Carbon	pH	Chemical Oxygen Demand (COD)
Total Phosphorus	Kjeldahl Nitrogen, Total (TKN)	Surfactants	Total Phenolic Compounds	Water Hardness	Colour

Further information on this range , please visit [sigma-aldrich.com/standards](http://sigma-aldrich.com/standards)

# Need to prove analytical competence to your accrediting body?

Ensuring your laboratory's results are accurate and precise is critical in a competitive market. The analytical competence of a laboratory is guaranteed in the form of accreditation from an approved body. An essential part of this process is the participation in proficiency testing. Visit [sigma-aldrich.com/pt](http://sigma-aldrich.com/pt) for more information regarding our scheduled and quick turn studies that are available to support your laboratory.



Request your copy of the RTC Environmental Proficiency Testing Brochure today  
[sigma-aldrich.com/ptbrochure](http://sigma-aldrich.com/ptbrochure)

## Did you know...

### WHAT ARE VITROIDS™?

Vitroids discs contain viable microorganisms in a certified quantity (ISO 17025), produced under reproducible conditions (ISO Guide 34) with strains primarily obtained from ATCC as well as other collections. The discs consist of bacteria or fungi in a solid water soluble matrix. Microorganisms in this form are stable for at least one year and are in a viable stage (no lag phase or recovery time). Applications of Vitroids include:

1. For use as qualitative or quantitative reference strains in routine quality control, for food, beverage, water and environmental testing
2. For method development and validations
3. As cultures used in research studies
4. For educational purposes
5. Vitroids are also available as matrix specific CRMs; these products are prefixed by MIC and QCMIC

For more information, visit  
[sigma-aldrich.com/vitroids](http://sigma-aldrich.com/vitroids)

## Technical Support

We have a specialist international team in place to help you choose the environmental CRMs that are right for your needs.

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UK and Other Countries	+44 1747 833312
North America	+512 238 9974 or 800 848 7837

Email: [rtc-eu@sial.com](mailto:rtc-eu@sial.com)

For the complete range of Certified Reference Materials, visit  
[sigma-aldrich.com/crm](http://sigma-aldrich.com/crm)

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