

Soils



Total and aqua regia leachable element content

		Certified values			
		ERM-CC141 - Loam soil 24 g			
Total element content	As	9.9 ± 1.5	mg/kg		
	Cd	0.35 ± 0.05	mg/kg		
	Co	8.5 ± 0.5	mg/kg		
	Cr	86 ± 8	mg/kg		
	Cu	14.4 ± 1.34	mg/kg		
	Hg	0.083 ± 0.017	mg/kg		
	Mn	464 ± 18	mg/kg		
	Ni	26.4 ± 2.4	mg/kg		
	Pb	41 ± 4	mg/kg		
	Zn	57 ± 4	mg/kg		
Aqua regia leachable	As	7.5 ± 1.4	mg/kg		
	Cd	0.25 ± 0.04	mg/kg		
	Co	7.9 ± 0.9	mg/kg		
	Cr	31 ± 4	mg/kg		
	Cu	12.4 ± 0.9	mg/kg		
	Hg	0.080 ± 0.008	mg/kg		
	Mn	387 ± 17	mg/kg		
	Ni	21.9 ± 1.6	mg/kg		
	Pb	32.2 ± 1.4	mg/kg		
	Zn	50 ± 4	mg/kg		
		BCR-142R - light sandy soil 50 g			
Total element content	Cd	0.34 ± 0.04	mg/kg		
	Co	12.1 ± 0.7	mg/kg		
	Cu	69.7 ± 1.3	mg/kg		
	Hg	0.067 ± 0.011	mg/kg		
	Mn	970 ± 16	mg/kg		
	Pb	64.5 ± 2.5	mg/kg		
Aqua regia leachable	Cd	0.249 ± 0.010	mg/kg		
	Pb	25.7 ± 1.6	mg/kg		
	Zn	93.3 ± 2.7	mg/kg		
		BCR-143R - Sewage sludge amended soil 50 g			
Total element content	Cd	71.8 ± 1.2	mg/kg		
	Co	12.3 ± 0.3	mg/kg		
	Cu	130.6 ± 1.5	mg/kg		
	Hg	1.10 ± 0.07	mg/kg		
	Mn	904 ± 13	mg/kg		
	Ni	299 ± 5	mg/kg		
	Pb	179.7 ± 2.1	mg/kg		
	Zn	1055 ± 14	mg/kg		
	Aqua regia leachable	Cd	72.0 ± 1.8	mg/kg	
		Cr	426 ± 12	mg/kg	
Mn		858 ± 11	mg/kg		
Ni		296 ± 4	mg/kg		
Pb		174 ± 5	mg/kg		
Zn		1063 ± 16	mg/kg		

Pedological parameters

IRMM-443-1 to IRMM-443-7 are representative for major European soil types. They are available in units of 200 g and are certified for the following pedological parameters:

- K_d of atrazine according OECD Testguideline 106
- 1/n of atrazine according OECD Testguideline 106
- K_d of 2,4-D according OECD Testguideline 106
- 1/n of 2,4-D according OECD Testguideline 106
- K_d of lindane according OECD Testguideline 106
- 1/n of lindane according OECD Testguideline 106
- pH in water according to ISO 10390
- pH in 0.01M CaCl₂ according to ISO 10390

Rare earth elements

		Certified values		
		ERM-CC690 calcareous soil 70 g		
	Ce	49.1 ± 2.5	mg/kg	
	Dy	2.90 ± 0.28	mg/kg	
	Gd	3.2 ± 0.4	mg/kg	
	La	24.4 ± 1.7	mg/kg	
	Nd	19.1 ± 2.2	mg/kg	
	Sc	7.9 ± 0.9	mg/kg	
	Sm	3.5 ± 0.4	mg/kg	
	Tb	0.50 ± 0.07	mg/kg	
	Th	7.6 ± 0.8	mg/kg	
	Tm	0.232 ± 0.026	mg/kg	
	U	1.90 ± 0.23	mg/kg	
	Yb	1.57 ± 0.19	mg/kg	

How to order reference materials

From JRC-IRMM

Tel.: +32 14 571 705 • Fax: +32 14 590 406
<https://ec.europa.eu/jrc/en/reference-materials>
 E-mail: jrc-irmm-rm-distribution@ec.europa.eu

From authorised distributors

LGC Standards GmbH (DE)
<http://www.lgcstandards.com/>
 E-mail: de@lgstandards.com

Sigma-Aldrich Chemie GmbH (CH)
<http://www.sigmaaldrich.com/irmm>
 E-mail: flukatec@sial.com

Sigma-Aldrich RTC Inc. (USA)
<http://www.RT-Corp.com>
 E-mail: RTCSalesgroup@sial.com

ARMI (USA)
<http://www.armi.com>
 E-mail: Info@ARMI.com

Industrial Analytical (RSA)
<http://www.industrialanalytical.co.za>
 E-mail: info@industrialanalytical.co.za



Accredited CRM Producer: the JRC-IRMM is accredited to ISO Guide 34:2009 for the production of reference materials under the code BELAC 268-IRM

Joint Research Centre Certified reference materials for sewage sludges, sediments and soils

Sewage sludges



Total and aqua regia leachable element content

		Certified values		
		BCR-145R sewage sludge (mixed origin) 40 g		
	Total element content			
	Cd	3.50 ± 0.15	mg/kg	
	Co	5.6 ± 0.4	mg/kg	
	Cu	696 ± 12	mg/kg	
	Hg	2.01 ± 0.22	mg/kg	
	Mn	156 ± 4	mg/kg	
	Ni	247 ± 7	mg/kg	
	Pb	286 ± 5	mg/kg	
	Zn	2122 ± 23	mg/kg	
	Aqua regia leachable			
	Cd	(3.43 ± 0.17)	mg/kg	
	Co	(5.3 ± 0.7)	mg/kg	
Cr	307 ± 13	mg/kg		
Cu	707 ± 9	mg/kg		
Hg	(1.99 ± 0.08)	mg/kg		
Mn	(145 ± 7)	mg/kg		
Ni	251 ± 6	mg/kg		
Pb	282 ± 9	mg/kg		
Zn	2140 ± 50	mg/kg		

Values in brackets are indicative only

Dioxins and furans

		Certified values		
		BCR-677 sewage sludge 40 g		
	Dioxins			
	D48	1.51 ± 0.16	ng/kg	
	D54	4.1 ± 0.9	ng/kg	
	D67	235 ± 16	ng/kg	
	D70	79 ± 7	ng/kg	
	D73	3500 ± 400	ng/kg	
	D75	12700 ± 800	ng/kg	
	Furans			
	F83	45 ± 4	ng/kg	
	F94	24.8 ± 1.6	ng/kg	
	F114	16.9 ± 1.5	ng/kg	
	F118	14.5 ± 1.6	ng/kg	
	F121	6.1 ± 0.8	ng/kg	
	F124	0.84 ± 0.29	ng/kg	
	F130	5.6 ± 0.6	ng/kg	
F131	6.2 ± 3	ng/kg		
F134	6.3 ± 0.8	ng/kg		
F135	1.77 ± 0.7	ng/kg		

Total and aqua regia leachable element content

		Certified values		
		BCR-146R sewage sludge (industrial origin) 50 g		
	Total element content			
	Cd	18.8 ± 0.5	mg/kg	
	Co	7.39 ± 0.27	mg/kg	
	Cr	196 ± 7	mg/kg	
	Cu	838 ± 16	mg/kg	
	Hg	8.6 ± 0.4	mg/kg	
	Mn	323 ± 7	mg/kg	
	Ni	70 ± 5	mg/kg	
	Pb	609 ± 14	mg/kg	
	Zn	3060 ± 60	mg/kg	
	Aqua regia leachable			
	Cd	18.4 ± 0.4	mg/kg	
Co	6.5 ± 0.4	mg/kg		
Cr	174 ± 7	mg/kg		
Cu	831 ± 16	mg/kg		
Hg	8.39 ± 0.25	mg/kg		
Mn	298 ± 9	mg/kg		
Ni	65.0 ± 3.0	mg/kg		
Pb	583 ± 17	mg/kg		
Zn	3040 ± 60	mg/kg		

Confidence in measurements

All certificates and detailed production information can be found at <https://crm.irmm.jrc.ec.europa.eu>



<https://ec.europa.eu/jrc/>

Sediments



Extractable element fractions		
		Extraction media for which values are assigned
BCR-483 sewage sludge amended soil 35 g	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-484 sewage sludge amended (terra rossa) soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid calcium chloride sodium nitrate ammonium nitrate
BCR-700 organic-rich soil	Cd, Cr, Cu, Ni, Pb, Zn	EDTA acetic acid

Metal species content		
		Certified values
ERM-CC580 estuarine sediment 40 g	Total Hg	132 ± 3 mg/kg
	CH ₃ Hg	0.075 ± 0.004 mg/kg
BCR-462 coastal sediment 25 g	Tributyltin	54 ± 15 µg/kg
	Dibutyltin	68 ± 12 µg/kg
BCR-646 freshwater sediment 40 g	Tributyltin	480 ± 80 µg/kg
	Dibutyltin	770 ± 90 µg/kg
	Monobutyltin	610 ± 120 µg/kg
	Triphenyltin	29 ± 11 µg/kg
	Diphenyltin	36 ± 8 µg/kg
	Monophenyltin	69 ± 18 µg/kg

Extractable element fractions		
		Certified values
BCR-684 river sediment, 35 g	NaOH-extractable P	550 ± 21 mg/kg
	HCl-extractable P	536 ± 28 mg/kg
	Inorganic P	1113 ± 24 mg/kg
	Organic P	209 ± 9 mg/kg
	Conc. HCl-extract. P	1373 ± 35 mg/kg
BCR-701 lake sediment, 20 g	Cd	Values according to the 3-step sequential extraction procedure; in addition, indicative values for total element contents are assigned
	Cr	
	Cu	
	Ni	
	Pb	
	Zn	

Organic pollutants		
		Certified values
BCR-524 industrial soil 40 g	Pyrene	173 ± 11 mg/kg
	benz[a]anthracene	22.5 ± 1.8 mg/kg
	benzo[a]pyrene	8.6 ± 0.5 mg/kg
	benzo[e]pyrene	10.6 ± 1.4 mg/kg
	Benzo[b]fluoranthene	13.5 ± 1.6 mg/kg
	Benzo[k]fluoranthene	6.2 ± 0.6 mg/kg
	Benzo [b] naphtho [2,1-d]-thiophene	3.8 ± 0.6 mg/kg
Indeno [1,2,3-cd] pyrene	5.1 ± 0.4 mg/kg	
Pentachlorophenol	0.034 ± 0.005 mg/kg	
BCR-481 industrial soil 25 g	PCB-101	37 ± 3 mg/kg
	PCB-118	9.4 ± 0.7 mg/kg
	PCB-128	9.1 ± 0.8 mg/kg
	PCB-149	97 ± 7 mg/kg
	PCB-153	137 ± 7 mg/kg
	PCB-156	7.0 ± 0.5 mg/kg
	PCB-170	52 ± 4 mg/kg
	PCB-180	124 ± 6 mg/kg

BCR-529 industrial (sandy) soil 50 g	3,4-dichlorophenol	0.23 ± 0.04 mg/kg
	2,4,5-trichlorophenol	1.51 ± 0.10 mg/kg
	Pentachlorophenol	0.23 ± 0.04 mg/kg
	D48	4.5 ± 0.6 µg/kg
	D54	0.44 ± 0.05 µg/kg
	D66	1.22 ± 0.21 µg/kg
	D67	5.4 ± 0.9 µg/kg
	D70	3.0 ± 0.4 µg/kg
	F83	0.078 ± 0.013 µg/kg
	F94	0.145 ± 0.028 µg/kg
	F114	0.36 ± 0.07 µg/kg
	F118	3.4 ± 0.5 µg/kg
	F121	1.09 ± 0.15 µg/kg
F124	0.022 ± 0.010 µg/kg	
F130	0.37 ± 0.05 µg/kg	

BCR-530 industrial (clay) soil 50 g	3,4-dichlorophenol	6.0 ± 0.5 mg/kg
	2,4,5-trichlorophenol	40 ± 7 mg/kg
	Pentachlorophenol	0.47 ± 0.09 mg/kg
	Dioxins and furans:	
	D67	0.061 ± 0.011 µg/kg
	D70	0.0218 ± 0.0029 µg/kg
	F94	0.24 ± 0.04 µg/kg
	F114	0.62 ± 0.07 µg/kg
	F118	0.321 ± 0.016 µg/kg
	F121	0.186 ± 0.023 µg/kg
	F130	0.126 ± 0.012 µg/kg

Total and aqua regia leachable element content			
		Certified values	
BCR-277R estuarine sediment 40 g	As	18.3 ± 1.8	mg/kg
	Cd	0.61 ± 0.07	mg/kg
	Co	22.5 ± 1.4	mg/kg
	Cr	188 ± 14	mg/kg
	Cu	63 ± 7	mg/kg
	Hg	0.128 ± 0.017	mg/kg
	Ni	130 ± 8	mg/kg
	Se	(0.58 ± 0.11)	mg/kg
	Sn	(6.5 ± 1.8)	mg/kg
	Zn	178 ± 20	mg/kg
	BCR-280R lake sediment 40 g	As	33.4 ± 2.9
Cd		0.85 ± 0.10	mg/kg
Co		16.8 ± 0.9	mg/kg
Cr		126 ± 7	mg/kg
Cu		53 ± 6	mg/kg
Fe		1.46 ± 0.20	mg/kg
Hg		69 ± 5	mg/kg
Mn		(0.46 ± 0.09)	mg/kg
Ni		(9.5 ± 1.7)	mg/kg
Sc		224 ± 25	mg/kg
BCR-320R channel sediment 30 g		As	21.7 ± 2.0
	Cd	2.64 ± 0.18	mg/kg
	Co	9.7 ± 0.6	mg/kg
	Cr	59 ± 4	mg/kg
	Cu	46.3 ± 2.9	mg/kg
	Fe	25700 ± 1300	mg/kg
	Hg	0.85 ± 0.09	mg/kg
	Mn	910 ± 50	mg/kg
	Ni	27.1 ± 2.2	mg/kg
	Pb	85 ± 5	mg/kg
	Sc	52 ± 0.4	mg/kg
	Se	(0.96 ± 0.18)	mg/kg
	Sn	(9.4 ± 1.7)	mg/kg
	Th	5.3 ± 0.4	mg/kg
	Tl	0.65 ± 0.08	mg/kg
	U	1.56 ± 0.20	mg/kg
	V	46.5 ± 2.8	mg/kg
	Zn	318 ± 20	mg/kg
	BCR-667 estuarine sediment, 40 g	Ce	56.7 ± 2.5
Dy		4.01 ± 0.14	mg/kg
Er		2.35 ± 0.15	mg/kg
Eu		1.00 ± 0.05	mg/kg
Gd		4.41 ± 0.12	mg/kg
Ho		0.80 ± 0.06	mg/kg
La		27.8 ± 1.0	mg/kg
Lu		0.325 ± 0.020	mg/kg
Nd		25.0 ± 1.4	mg/kg
Pr		6.1 ± 0.5	mg/kg
Sc		13.7 ± 0.7	mg/kg
Sm		4.66 ± 0.20	mg/kg
Tb		0.682 ± 0.017	mg/kg
Th		10.0 ± 0.5	mg/kg
Tm		0.326 ± 0.025	mg/kg
U		2.26 ± 0.15	mg/kg
Yb		2.20 ± 0.09	mg/kg

Values in brackets are indicative only.

Organic pollutants		
		Certified values
BCR-535 freshwater harbour sediment 40 g	Pyrene	2.52 ± 0.18 mg/kg
	Benzo[a]anthracene	1.54 ± 0.10 mg/kg
	Benzo[a]pyrene	1.16 ± 0.10 mg/kg
	Benzo[e]pyrene	1.86 ± 0.13 mg/kg
	Benzo[b]fluoranthene	2.29 ± 0.15 mg/kg
	Benzo[k]fluoranthene	1.09 ± 0.15 mg/kg
BCR-536 freshwater harbour sediment 40 g	PCB-28	44 ± 5 µg/kg
	PCB-52	38 ± 4 µg/kg
	PCB-101	44 ± 4 µg/kg
	PCB-105	3.5 ± 0.6 µg/kg
	PCB-118	28 ± 3 µg/kg
	PCB-128	5.4 ± 1.2 µg/kg
	PCB-138	27 ± 4 µg/kg
	PCB-149	49 ± 4 µg/kg
	PCB-153	50 ± 4 µg/kg
	PCB-156	3.0 ± 0.4 µg/kg
	PCB-163	17 ± 3 µg/kg
	PCB-170	13.4 ± 1.4 µg/kg
	PCB-180	22 ± 2 µg/kg

