

JSAC Reference materials

(Manufacturer: Japan Society for Analytical Chemistry)

➤ Environment (Plastics)

● JSAC CRM 0611-2 – 0615-2 (disk)

Plastics (polyester) for Fluorescent X-ray Analysis (40mm dia. x 4.0mm thick.: 5 pcs / set)		
CRM	Elements	Certified value
JSAC 0611-2 (for blank test)	Pb	0.00 ± 0.06
	Cd	0.00 ± 0.01
	Cr	0.00 ± 0.04
JSAC 0612-2	Pb	24.2 ± 0.3
	Cd	8.6 ± 0.2
	Cr	24.3 ± 0.4
JSAC 0613-2	Pb	48.5 ± 0.7
	Cd	21.9 ± 0.6
	Cr	48.8 ± 0.5
JSAC 0614-2	Pb	95.9 ± 1.8
	Cd	43.0 ± 1.3
	Cr	96.6 ± 1.3
JSAC 0615-2	Pb	192.9 ± 3.0
	Cd	86.6 ± 2.4
	Cr	194.1 ± 2.1

mass fraction (μg/g)

● JSAC CRM 0621 - 0625 (disk)

Plastics (polyester) for Fluorescent X-ray Analysis of Trace Mercury (40mm dia. x 4.0mm thick.: 5 pcs / set)		
CRM	Elements	Certified value
JSAC 0621 (for blank test)		Reference value Less than 1
JSAC 0622	Hg	10.0 ± 0.2
JSAC 0623	Hg	49.0 ± 1.0
JSAC 0624	Hg	121.1 ± 2.2
JSAC 0625	Hg	244.4 ± 6.3

mass fraction (μg/g)

● JSAC CRM 0641 and JSAC CRM 0642 (chips)

Plastics (PBDEs) for Chemical Analysis (each 25g)		
CRM	Elements	Certified value
JSAC 0641	Deca	27.2 ± 2.6
	Nona	21.1 ± 2.7
	Octa	46.9 ± 6.6
	Hepta	60.0 ± 4.7
	Hexa	16.4 ± 2.0
	Penta	28.2 ± 3.8
	Tetra	18.7 ± 2.5
	Br	170 ± 5
JSAC 0642	Deca	137 ± 13
	Nona	113 ± 15
	Octa	287 ± 42
	Hepta	361 ± 30
	Hexa	75 ± 13
	Br	792 ± 12

mass fraction (µg/g)

● JSAC CRM 0651 - JSAC CRM 0655 (disk)

Plastics (polyester) for Fluorescent X-ray Analysis of Bromine (40mm dia. x 4.0mm thick.: 5 pcs / set)		
CRM	Elements	Certified value
JSAC 0651 (for blank test)	Br	Reference value Less than 1
JSAC 0652	Br	105.8 ± 3.6
JSAC 0653	Br	292.6 ± 7.9
JSAC 0654	Br	595 ± 15
JSAC 0655	Br	993 ± 23

mass fraction (µg/g)

● JSAC PT0661-3 (disk)

Plastics (polyester) for Chemical Analysis for Chlorine (40mm dia. x 4.0mm thick.)		
CRM	Elements	Assigned value (µg/g)
	-	-
JSAC PT0661-3	Cl	185

➤ *Environment (Soil)*

- JSAC CRM 0401 (Added): Metallic components in brown forest soil (50g)
- JSAC CRM 0411: Metallic components in volcanic ash soil (50g)

Element	Concentration (mg/kg)	
	JSAC 0401	JSAC 0411
Cd	4.25 ± 0.41	0.274 ± 0.023
Pb	26 ± 4	18.9 ± 2.6
Cr	50.4 ± 5.1	23.5 ± 1.8
As	10.62 ± 0.65	11.3 ± 0.5
Se	0.27 ± 0.05	1.32 ± 0.27
Be	5.28 ± 0.35	1.04 ± 0.23
Cu	15.3 ± 1.3	26.7 ± 1.1
Zn	66.8 ± 2.7	64.6 ± 2.0
Ni	18.9 ± 1.3	11 ± 1
Mn	266 ± 9	943 ± 28
V	65.0 ± 2.6	68.6 ± 3.5

- JSAC CRM 0402-2: Inorganic components in brown forest soil
(including analysis of 1 mol/L HCl extract) (50g)

Element	Concentration (mg/kg)	
	JSAC 0402-2	
Cd	31.0 ± 1.3	
Pb	45.7 ± 5.2	
As	38.6 ± 4.2	
T-Cr	53.4 ± 2.5	
Se	24.8 ± 2.3	
Cu	13.5 ± 0.6	
Zn	78.6 ± 8.5	
Ni	10.6 ± 0.5	
Mn	755 ± 70	
V	76.6 ± 4.2	
Hg	2.0 ± 0.2	
B	48.4 ± 8.0	
F	312 ± 56	

● JSAC CRM 0461-0466:

Hazardous metallic components in polluted soil (25g x 6 bottles)

Element	Concentration (mg/kg)					
	JSAC 461	JSAC 462	JSAC 463	JSAC 464	JSAC 465	JSAC 466
Cd	(0.3)	74.2 ± 2.0	146.8 ± 3.3	301.0 ± 8.7	607.4 ± 9.4	1199 ± 19
Pb	24.4 ± 1.1	73.7 ± 2.7	151.6 ± 5.4	302.7 ± 7.6	612.4 ± 13.0	1214 ± 26
As	21.53 ± 0.74	71.5 ± 2.9	137.6 ± 4.0	271.1 ± 9.0	550 ± 18	1093 ± 32
Se	(0.44)	71.5 ± 2.1	141.5 ± 3.6	291.9 ± 5.8	587 ± 13	1175 ± 26
Cr	97.4 ± 7.6	149.6 ± 8.9	244 ± 10	499 ± 22	738 ± 16	1483 ± 23
Hg	0.075 ± 0.008	7.27 ± 0.24	14.76 ± 0.57	28.6 ± 1.1	57.8 ± 1.9	113.5 ± 5.6

() non-certified value

● JSAC CRM 0301-4a : River Water (500ml) (No Addition)

● JSAC CRM 0302-4a : River Water (500ml) (Addition)

Element	Concentration (mg/kg)		Element	Concentration (mg/kg)	
	JSAC 0301-4a	JSAC 0302-4a		JSAC 0301-4a	JSAC 0302-4a
	(µg / L)	(µg / L)		(mg /L)	(mg /L)
Pd	(0.010)	9.7 ± 0.2	K	0.47 ± 0.01	0.47 ± 0.01
Cr	0.15 ± 0.01	9.96 ± 0.13	Na	3.92 ± 0.09	3.9 ± 0.1
Cd	(0.002)	0.98 ± 0.01	Mg	3.04 ± 0.07	3.1 ± 0.1
Se	(0.060)	5.0 ± 0.2	Ca	12.7 ± 0.3	12.7 ± 0.3
As	0.21 ± 0.01	5.2 ± 0.1			
Cu	0.35 ± 0.02	10.2 ± 0.2			
Fe	11.1 ± 0.4	67 ± 1			
Mn	0.46 ± 0.02	5.7 ± 0.1			
Zn	0.70 ± 0.04	10.3 ± 0.3			
B	7.8 ± 0.3	56 ± 1			
Al	19.5 ± 0.6	79 ± 2			
Ni	-	16.8 ± 0.3			
Be	-	0.99 ± 0.04			
Ba	(1.7)	0.89 ± 0.04			
Mo	0.38 ± 0.02	0.38 ± 0.01			
U	0.0025 ± 0.0002	0.0026 ± 0.0001			

() non-certified value

➤ *Environment (Coal)*

- JSAC CRM 0521: Inorganic components in coal ash (domestic) (50g)
- JSAC CRM 0522: Inorganic components in coal ash (foreign) (50g)

Element	JSAC 0521	JSAC 0522
Main elements Concentration (%)		
Si	27.16 ± 0.31	27.76 ± 0.30
Al	13.48 ± 0.22	15.20 ± 0.29
Fe	3.09 ± 0.07	2.92 ± 0.05
Na	0.48 ± 0.02	0.13 ± 0.01
K	1.99 ± 0.09	0.24 ± 0.01
Mg	0.87 ± 0.02	0.36 ± 0.01
Ca	1.31 ± 0.02	0.93 ± 0.02
P	0.400 ± 0.010	0.146 ± 0.005
Sr	0.113 ± 0.004	0.122 ± 0.004
Ti	0.65 ± 0.01	1.03 ± 0.02
C	1.21 ± 0.03	1.03 ± 0.01
S	0.066 ± 0.004	0.067 ± 0.004
LOI	1.47 ± 0.05	1.36 ± 0.04
Trace elements Concentration (mg/kg)		
As	19.7 ± 1.3	55.2 ± 3.5
B	148 ± 10	85.6 ± 6.7
Be	3.03 ± 0.31	10.4 ± 0.7
Cd	(0.46 ± 0.13)	0.98 ± 0.13
Co	27.8 ± 4.1	47.4 ± 6.2
Cr	102 ± 4	139 ± 5
Cu	103 ± 4	113 ± 5
F	153 ± 7	(33 ± 13)
Hg	0.14 ± 0.01	(<0.01)
Mn	315 ± 11	240 ± 8
Ni	62.8 ± 2.0	106 ± 5
Pb	54.0 ± 4.4	98.1 ± 5.8
Se	0.75 ± 0.10	(<0.1)
V	225 ± 6	130 ± 7
Zn	137 ± 8	303 ± 19

() non-certified value

➤ *Environment (Dioxins)*

- JSAC CRM 0501: Dioxins in fly-ash (high concentration) (50g)
- JSAC CRM 0502: Dioxins in fly-ash (low concentration) (50g)

Element	TEQ (ng/g)	
	JSAC 0501	JSAC 0502
PCDDs + PCDFs	2.40 ± 0.16	0.860 ± 0.057
DL-PCBs	0.0283 ± 0.0017	0.0195 ± 0.0015
Total	2.43 ± 0.16	0.879 ± 0.060

- JSAC CRM 0511: Dioxins in combustion dust (high concentration) (60g)
- JSAC CRM 0512: Dioxins in combustion dust (low concentration) (60g)

Element	TEQ (pg/g)	
	JSAC 0511	JSAC 0512
PCDDs + PCDFs	714 ± 20	124.2 ± 7.8
DL-PCBs	17.94 ± 0.86	2.96 ± 0.15
Total	732 ± 21	127.1 ± 7.3

- JSAC CRM 0421: Dioxins in soil (low concentration) (60g)
- JSAC CRM 0422: Dioxins in soil (high concentration) (60g)

Element	TEQ (pg/g)	
	JSAC 0421	JSAC 0422
PCDDs + PCDFs	33.3 ± 3.2	99.3 ± 9.6
DL-PCBs	4.21 ± 0.60	12.2 ± 1.8
Total	37.6 ± 3.5	111.4 ± 9.6

- JSAC CRM 0431: Dioxins in river sediment (low concentration) (60g)
- JSAC CRM 0432: Dioxins in river sediment (high concentration) (60g)

Element	TEQ (pg/g)	
	JSAC 0431	JSAC 0432
PCDDs + PCDFs	43.8 ± 2.1	61.8 ± 3.4
DL-PCBs	7.74 ± 0.82	11.96 ± 0.85
Total	51.6 ± 2.8	73.8 ± 3.8

- JSAC CRM 0451: Dioxins in marine sediment (low concentration) (60g)
- JSAC CRM 0452: Dioxins in marine sediment (high concentration) (60g)

Element	TEQ (pg/g)	
	JSAC 0451	JSAC 0452
PCDDs + PCDFs	12.65 ± 0.45	51.6 ± 1.6
DL-PCBs	2.47 ± 0.12	14.86 ± 0.46
Total	15.13 ± 0.61	66.5 ± 2.3

- JSAC CRM 0321-4: Dioxins in Synthesized wastewater (3L × 2 bottles / set)

Element	TEQ (pg/g)	TEQ (pg/L)
	JSAC 0311	JSAC 0321-4
PCDDs + PCDFs		25.08 ± 0.46
DL-PCBs	Sold Out	4.43 ± 0.09
Total		29.52 ± 0.53

➤ *Material*

● JSAC CRM 0111: Trace oxygen in steel

Element	($\mu\text{g/g}$)	Size
Oxygen	2.3 ± 0.4	32 mm dia. \times 32 mm length

Note: Concentration of trace oxygen in bearing steel was certified by means of charged particle radiation method that is not affected from surface oxygen.

● JSAC CRM 0121-B: Trace impurities in aluminum (Block)

● JSAC CRM 0121-C: Trace impurities in aluminum (Chips)

Element	JSAC 0121-B	JSAC 0121-C
	25mm \times 25 mm \times 15 mm	Chips (50g)
Si	11.0 ± 0.6	11.0 ± 0.6
Fe	9.4 ± 0.3	9.4 ± 0.3
Cu	3.48 ± 0.11	3.48 ± 0.11
Mn	1.73 ± 0.06	1.73 ± 0.06
Mg	2.82 ± 0.13	2.82 ± 0.13
Zn	2.03 ± 0.15	2.03 ± 0.15
Ti	1.96 ± 0.07	1.96 ± 0.07
Cr	1.13 ± 0.06	1.13 ± 0.06
Zr	2.02 ± 0.13	2.02 ± 0.13
B	1.98 ± 0.11	1.98 ± 0.11

● JSAC CRM 0131 – 0134 (disk)

Lead-free Solder Alloy					
(Size with resin 40mm dia. x 4.0mm thick.: 4pcs / set)					
(Solder part: 30mm dia. x 2.20mm thick)					
CRM	Element	Certified value	CRM	Element	Certified value
JSAC 0131	Pb	13.9 ± 0.7	JSAC 0133	Pb	1022 ± 19
	Cd	(< 3)		Cd	832 ± 9
	Ag	0.488 ± 0.007		Ag	3.41 ± 0.02
	Cu	0.102 ± 0.002		Cu	0.756 ± 0.009
JSAC 0132	Pb	520.9 ± 8.9	JSAC 0134	Pb	2007 ± 25
	Cd	88.0 ± 3.2		Cd	1530 ± 17
	Ag	2.98 ± 0.02		Ag	3.91 ± 0.03
	Cu	1.01 ± 0.02		Cu	0.513 ± 0.009

mass fraction (Pb, Cd: mg/kg; Ag, Cu: %)

● JSAC CRM 0141 – 0143 : High Purity Magnesium (50mm dia. x 20mm thick disk)

Element	Concentration ($\mu\text{g/g}$)		
	JSAC 0141	JSAC 0142	JSAC 0143
Al	137 ± 5	66 ± 3	(4.8)
Si	216 ± 11	72 ± 7	(19)
Ca	121 ± 9	(35)	-
Mn	208 ± 12	101 ± 5	16 ± 1
Cu	8.9 ± 0.7	(1.4)	(1.1)
Zn	(23)	21 ± 2	14 ± 1
Ga	1.3 ± 0.2	1.1 ± 0.1	1.2 ± 0.1
Pd	(3.2)	3.6 ± 0.7	(3.7)

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● JSAC CRM 0151 - 0154 : Generic Magnesium Alloy (50mm dia. x 20mm thick disk)

Element	Concentration ($\mu\text{g/g}$)			
	JSAC 0151	JSAC 0152	JSAC 0153	JSAC 0154
Li	-	2.1 ± 0.3	-	-
Be	-	-	7.6 ± 0.9	-
Si	174 ± 10	96 ± 6	249 ± 18	267 ± 10
Fe	42 ± 2	34 ± 2	(4.3)	12 ± 1
Ni	(1.2)	(2.1)	(3.6)	(4.3)
Cu	(2.7)	(3.3)	11 ± 1	7.1 ± 0.4
Ga	5.7 ± 0.5	12 ± 1	11 ± 1	12 ± 1
La	(0.12)	0.43 ± 0.03	12 ± 1	(0.19)
Ce	(0.22)	0.63 ± 0.11	17 ± 1	(0.38)
Pb	(2.8)	(2.4)	3.6 ± 0.5	13 ± 1
	mass fraction (%)			
Al	3.2 ± 0.1	6.7 ± 0.1	8.8 ± 0.2	6.0 ± 0.1
Mn	0.46 ± 0.01	0.38 ± 0.01	0.26 ± 0.01	0.30 ± 0.01
Zn	0.79 ± 0.02	0.93 ± 0.02	0.73 ± 0.01	0.0141 ± 0.0005

() non-certified value