Supporting Information

Zinc Isotopic Compositions of 23 Certified Biological Reference Materials (Plants, Animal Tissues, Foods) Measured by MC-ICP-MS

Table S1. **The Procedure of Zn purification with AG MP-1M**

Purification step	**Eluant**	**Volume (mL)**
Conditioning	7 mol L^{-1} HCl + 0.001%H_2O_2	7
Sample loading	7 mol L^{-1} HCl + 0.001%H_2O_2	1
Elution of the impurities	7 mol L^{-1} HCl + 0.001%H_2O_2	7
Elution of Cu	7 mol L^{-1} HCl + 0.001%H_2O_2	20
Check	7 mol L^{-1} HCl + 0.001%H_2O_2	10
Elution of Fe	2 mol L^{-1} HCl + 0.001%H_2O_2	20
Resin cleaning	0.5 mol L^{-1} HNO_3	2
Collection of Zn	0.5 mol L^{-1} HNO_3	11

Table S2. Instrument parameters for Zn isotope by MC-ICP-MS

Parameter	**Value**
RF power	1300 W
Coolant gas	13.5 L min^{-1}
Auxiliary gas	0.95 L min^{-1}
Nebulizer gas	32-36 psi
Mass Resolution	Low resolution
Measurements/block	40
Integration time	7 s
Nebulizer	0.2mL /min Quartz nebulizer
Cones	standard wet cone
Collector configuration	L5 (^{62}Ni), L3 (^{63}Cu), L1 (^{64}Zn), H3 (^{66}Zn), H5 (^{67}Zn), H7 (^{68}Zn), H10 (^{71}Ga)

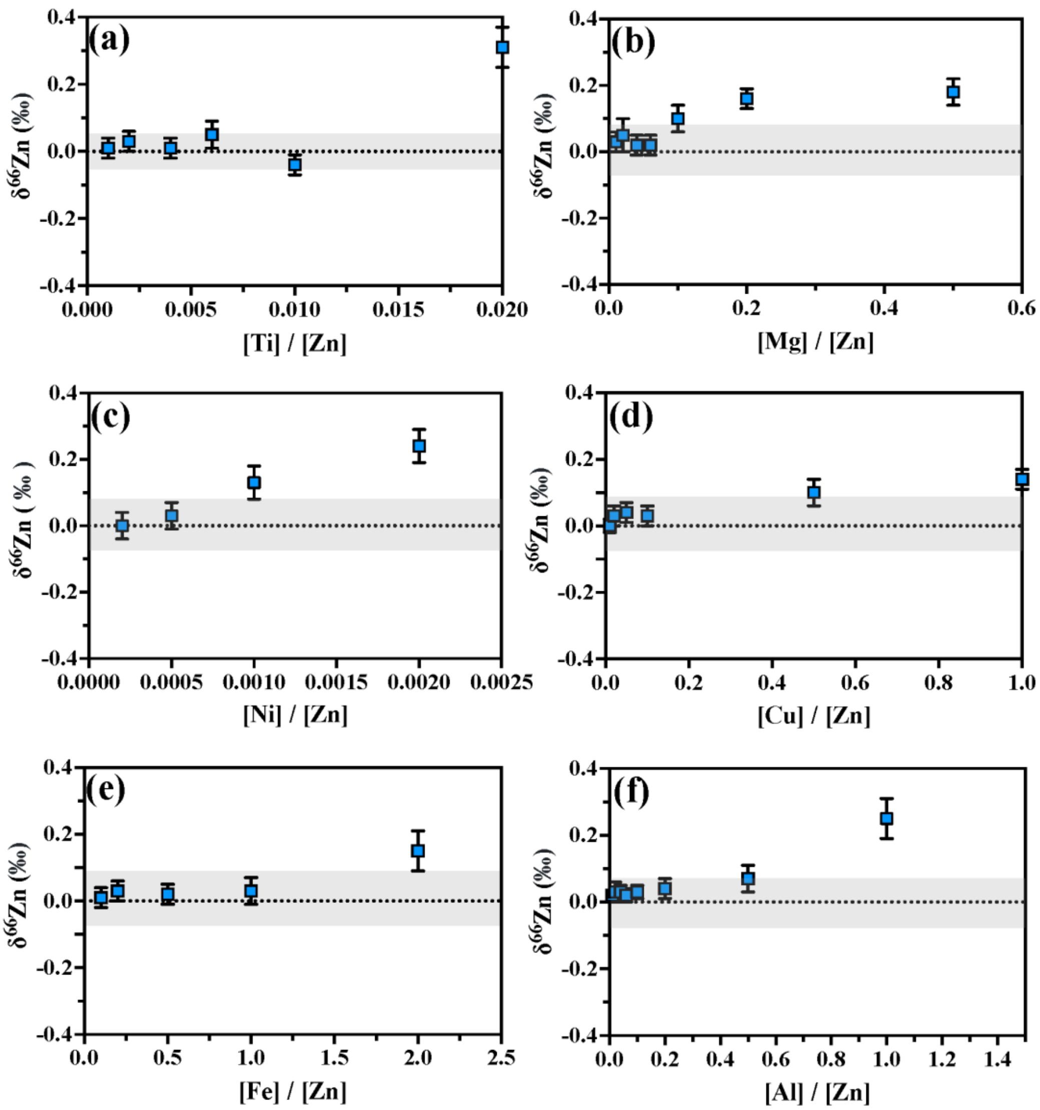

Fig. S1 Zn isotopic variations of Alfa-Zn standard solutions spiked with different amounts of Ti, Mg, Ni, Cu, Fe and Al. The grey horizontal area represents the 2SD range of ± 0.07 ‰

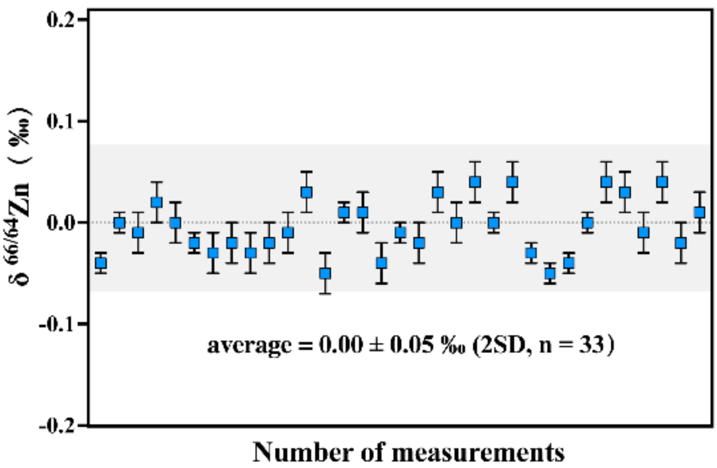

Fig. S2 Long-term measurements of pure standard solution IRMM-3702

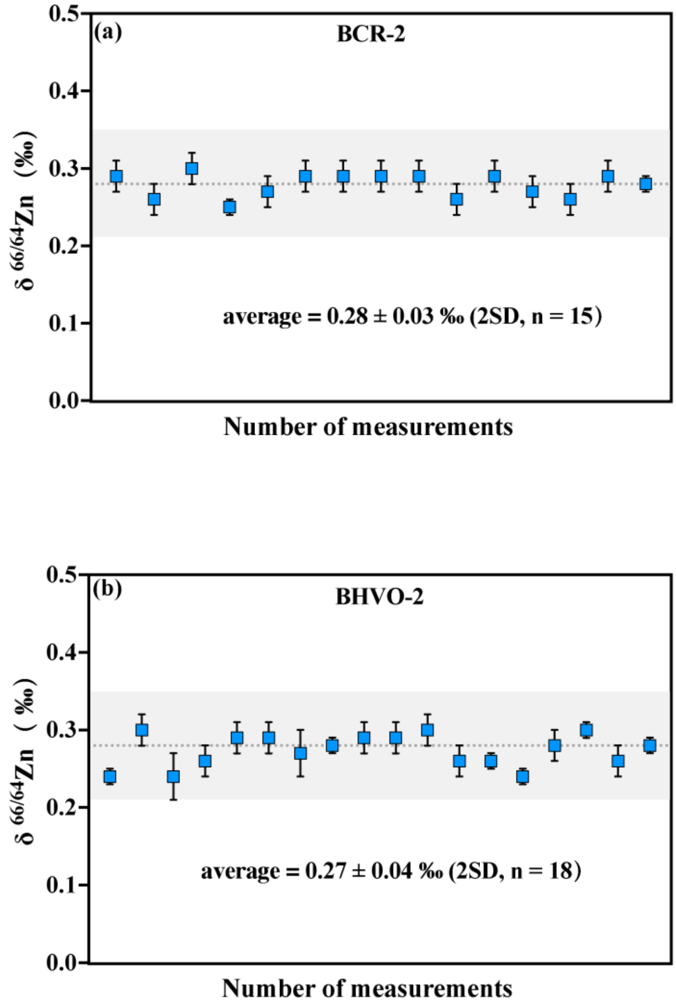

Fig. S3 The multiple measurement results of BCR-2 and BHVO-2

Table S3. Isotopic composition of Zn in reference materials in this study.

Reference name	Replicates	Zn recovery of digestion (%)	$\delta^{66/64}Zn_{IRMM3702}$	$\delta^{68/64}Zn_{IRMM3702}$	$\delta^{66/64}Zn_{JMC}$	$\delta^{68/64}Zn_{JMC}$	n
GBW10011a	1		0.25±0.02	0.55±0.07	0.52±0.02	1.09±0.07	3
	2		0.23±0.05	0.47±0.02	0.50±0.05	1.01±0.02	3
	Mean ± 2 SD	109 ± 9	0.24±0.03	0.51±0.11	0.51±0.03	1.05±0.11	6
GBW10014	1		-0.04±0.03	-0.14±0.04	0.23±0.03	0.40±0.04	3
	2		-0.03±0.03	-0.08±0.05	0.24±0.03	0.46±0.05	3
	Mean ± 2 SD	94 ± 4	-0.04±0.01	-0.11±0.08	0.24±0.02	0.43±0.08	6
GBW10015	1		0.50±0.05	1.06±0.04	0.77±0.05	1.60±0.04	3
	2		0.52±0.02	1.08±0.03	0.79±0.02	1.62±0.03	3
	Mean ± 2 SD	90 ± 2	0.51±0.03	1.07±0.03	0.78±0.03	1.61±0.03	6
GBW10020	1		0.14±0.06	0.36±0.09	0.41±0.06	0.90±0.09	3
	2		0.18±0.05	0.44±0.10	0.45±0.05	0.98±0.10	3
	Mean ± 2 SD	91 ± 8	0.16±0.06	0.40±0.11	0.43±0.06	0.94±0.11	6
GBW10023	1		0.35±0.05	0.69±0.11	0.62±0.05	1.23±0.11	3
	2		0.37±0.01	0.70±0.10	0.64±0.01	1.24±0.10	3
	Mean ± 2 SD	94 ± 2	0.36+0.03	0.70±0.01	0.63±0.03	1.24±0.02	6
GBW10025	1		0.03±0.05	0.05±0.04	0.30±0.05	0.59±0.04	3
	2		0.02±0.06	0.02±0.04	0.29±0.06	0.56±0.04	3
	Mean ± 2 SD	91 ± 7	0.03±0.01	0.04±0.04	0.30±0.02	0.58±0.04	6
GBW10026	1		0.26±0.03	0.69±0.06	0.53±0.03	1.23±0.06	3

	2		0.29±0.02	0.66±0.02	0.56±0.02	1.20±0.02	3
	Mean ± 2 SD	89 ± 2	0.28+0.04	0.68±0.04	0.55±0.04	1.22±0.04	6
GBW10027	1		0.56±0.03	1.15±0.09	0.83±0.03	1.69±0.09	3
	2		0.57±0.06	1.13±0.04	0.84±0.06	1.67±0.04	3
	Mean ± 2 SD	88 ± 2	0.57±0.01	1.14±0.03	0.84±0.02	1.68±0.03	6
GBW10028	1		0.34±0.03	0.78±0.02	0.61±0.03	1.32±0.02	3
	2		0.33±0.04	0.71±0.05	0.60±0.04	1.25±0.05	3
	Mean ± 2 SD	109 ± 2	0.34±0.01	0.75±0.10	0.61±0.02	1.29±0.10	6
GBW07602	1		0.44±0.01	0.85±0.04	0.71±0.01	1.39±0.04	3
	2		0.41±0.06	0.88±0.04	0.68±0.06	1.42±0.04	3
	Mean ± 2 SD	89 ± 3	0.43±0.04	0.87±0.04	0.70±0.04	1.41±0.04	6
GBW07604	1		0.50±0.03	0.99±0.07	0.77±0.03	1.53±0.07	3
	2		0.54±0.04	1.06±0.05	0.81±0.04	1.60±0.05	3
	Mean ± 2 SD	93 ± 1	0.52±0.06	1.03±0.10	0.79±0.06	1.57±0.10	6
GBW07605	1		-0.08±0.04	-0.21±0.10	0.19±0.04	0.33±0.10	3
	2		-0.09±0.06	-0.20±0.02	0.18±0.06	0.34±0.02	3
	Mean ± 2 SD	104 ± 3	-0.09±0.01	-0.21±0.01	0.19±0.02	0.34±0.02	6
GBW10018	1		-0.44±0.05	-0.78±0.06	-0.17±0.05	-0.24±0.06	3
	2		-0.46±0.07	-0.85±0.10	-0.19±0.07	-0.31±0.10	3
	Mean ± 2 SD	99 ± 3	-0.45±0.03	-0.82±0.10	-0.18±0.03	-0.28±0.10	6
GBW10024	1		0.08±0.01	0.17±0.03	0.35±0.01	0.71±0.03	3
	2		0.07±0.03	0.15±0.03	0.34±0.03	0.69±0.03	3
	Mean ± 2 SD	97 ± 6	0.08±0.01	0.16±0.03	0.35±0.02	0.70±0.03	6
GBW10050	1		0.03±0.05	0.11±0.10	0.30±0.05	0.65±0.10	3

	2		0.05±0.01	0.19±0.01	0.32±0.01	0.73±0.01	3
	Mean ± 2 SD	89 ± 7	0.04±0.03	0.15±0.11	0.31±0.03	0.69±0.11	6
GBW10051	1		-0.87±0.02	-1.56±0.06	-0.60+0.02	-1.02±0.06	3
	2		-0.88±0.03	-1.49±0.03	-0.61±0.03	-0.95±0.03	3
	Mean ± 2 SD	97 ± 2	-0.88±0.01	-1.53±0.10	-0.61±0.02	-0.99±0.10	6
GBW09101	1		-0.32±0.05	-0.61±0.10	-0.05±0.05	-0.07±0.10	3
	2		-0.35±0.04	-0.65±0.04	-0.08±0.04	-0.11±0.04	3
	Mean ± 2 SD	92 ± 4	-0.34±0.04	-0.63±0.06	-0.07±0.04	-0.09±0.06	6
GBW09101b	1		-0.34±0.06	-0.67±0.10	-0.07±0.06	-0.13±0.10	3
	2		-0.36±0.06	-0.61±0.06	-0.09±0.06	-0.07±0.06	3
	Mean ± 2 SD	101 ± 5	-0.35±0.03	-0.64±0.08	-0.08±0.03	-0.10±0.08	6
GBW10017	1		0.42±0.03	0.85±0.05	0.69±0.03	1.39±0.05	3
	2		0.45±0.03	0.91±0.06	0.72±0.03	1.45±0.06	3
	Mean ± 2 SD	95 ± 1	0.44±0.04	0.88±0.08	0.71±0.04	1.42±0.08	6
CDIF-ELEMENT-ZK-004	1		0.37±0.07	0.73±0.11	0.64±0.07	1.27±0.11	3
	2		0.38±0.05	0.78±0.02	0.65±0.05	1.32±0.02	3
	Mean ± 2 SD	97 ± 2	0.38±0.01	0.76±0.07	0.65±0.02	1.30±0.07	6
GB2025-5050	1		0.23±0.04	0.46±0.09	0.50±0.04	1.00±0.09	3
	2		0.21±0.05	0.53±0.04	0.48±0.05	1.07±0.04	3
	Mean ± 2 SD	89 ± 7	0.22±0.03	0.50±0.10	0.49±0.03	1.04±0.10	6
GB2025-5051	1		0.33±0.02	0.69±0.03	0.60±0.02	1.23±0.03	3
	2		0.38+0.02	0.72±0.10	0.65±0.02	1.26±0.10	3
	Mean ± 2 SD	101 ± 8	0.36±0.07	0.71±0.04	0.63±0.07	1.25±0.04	6
GBW10055	1		0.60±0.05	1.20±0.08	0.87±0.05	1.74±0.08	3

	2		0.61±0.05	1.24±0.03	0.88±0.05	1.78±0.03	3
	Mean ± 2 SD	92 ± 4	0.61±0.01	1.22±0.06	0.88±0.01	1.76±0.06	6

Uncertainties are expressed as two standard deviations

n is the repeated measurements of the same sample solution

Table S4. Zn isotope compositions of biological reference materials from previous studies

Type	Reference name	Description	$\delta^{66/64}$Zn	2SD	References
Plants	NIST SRM 1570	Spinach	0.69	0.03	Costas-Rodriguez et al. (2013) [9]
	BCR-CRM 281	Ryegrass	0.40	0.09	Arnold et al. (2015) [30]
	BCR-62	Olive leaves	0.42	0.02	Tang et al. (2012) [28]
	BCR-383	Haricots vert	0.44	0.04	Sauzéat et al. (2021) [31]
	NIST SRM 1573a	Tomato leaves	0.79	0.09	Araújo et al. (2016) [29]
	NIST SRM 1547	Peach leaves	-0.06	0.14	Rodushkin et al. (2016) [32]
	BCR-670	Aquatic plant	0.23	0.01	Jeong et al. (2021) [10]
	BCR CRM 482	Lichen	0.07	0.10	Dinis et al. (2018) [33]
	BCR-279	Sea lettuce	0.51	0.03	Jeong et al. (2021) [10]
Animal tissues	SRM 8414	Bovine muscle	0.42	0.03	Stenberg et al. (2004) [37]
	BCR CRM 184	Bovine muscle	0.02	0.02	Costas-Rodriguez et al. (2013) [9]
	NIST SRM 1577a	Bovine liver	0.24	0.02	Costas-Rodriguez et al. (2013) [9]
	NIST SRM 1577c	Bovine liver	-0.16	0.02	Retzmann et al. (2024) [26]
	ERM-BB184	Bovine muscle	-0.03	0.1	Moore et al. (2017) [25]
	GBW10051	Pork liver	-0.65	0.02	Guo et al. (2023) [24]

	ERM-BB186	Pig kidney	-0.43	0.14	Guo et al. (2023)[24]
	BCR 414	Plankton	0.29	0.02	Jeong et al. (2021) [10]
			0.36	0.09	Druce et al. (2020)[27]
	ERM-BB422	fish muscle	-0.07	0.04	Moore et al. (2017) [25]
	Dogfish liver	DOLT-4	-0.96	0.02	Jeong et al. (2021) [10]
			-0.98	0.05	Druce et al. (2020)[27]
	Dogfish liver	DOLT-5	-1.02	0.03	Druce et al. (2020)[27]
	GBW10050	Prawn	0.28	0.03	Guo et al. (2023) [24]
	ERM-CE464	Tuna fish	-0.42	0.04	Sauzéat et al. (2021) [31]
	DORM-4	Fish protein	0.09	0.01	Jeong et al. (2021) [10]
	NIST SRM 2976	Mussel tissue	0.56	0.04	Jeong et al. (2021) [10]
	BCR CRM 278	Mussel tissue	0.73	0.01	Costas-Rodriguez et al. (2013) [9]
	ERM-CE278	Mussel tissue	0.72	0.02	Jeong et al. (2021) [10]
			0.73	0.01	Costas-Rodriguez et al. (2013) [9]
	BCR CRM TORT-1	Lobster liver	0.88	0.1	Rodushkin et al. (2016) [32]
	BCR CRM TORT-2	Lobster hepatopancreas	0.51	0.02	Jeong et al. (2021) [10]
	BCR CRM TORT-3	Lobster liver	0.23	0.04	Sauzéat et al. (2021） [31]
	NIST SRM1566b	Oyster	0.71	0.02	Jeong et al. (2021) [10]
Human tissues	GBW(E)0910933	Human serum	-0.17	0.04	Guo et al. (2023) [24]
	ERM-DB001	Human hair	-0.06	0.05	Retzmann et al. (2024) [26]

	GBW07601	Human hair	0.07	0.03	Stenberg et al. (2004) [37]
	GBW09101	Human hair	-0.05	0.06	Retzmann et al. (2024) [26]
	GBW09101b	Human hair	-0.14	0.02	Guo et al. (2023) [24]
Food producets	GBW10054	Skimmed soybean	0.86	0.05	Guo et al. (2023) [24]
	GBW10055	Whole soybean	0.87	0.03	Guo et al. (2023) [24]
	GBW(E)100199	Pumpkin	0.62	0.02	Guo et al. (2023) [24]
	NIST SRM 1568a	Rice flour	0.39	0.01	Costas-Rodriguez et al. (2013) [9]
	NIST SRM 1567a	wheat flour	1.17	0.08	Costas-Rodriguez et al. (2013) [9]
	BCR CRM 189	Whole meal flour	0.61	0.05	Costas-Rodriguez et al. (2013) [9]
	BCR CRM 063R	Skimmed milk	0.52	0.03	Costas-Rodriguez et al. (2013) [9]
	GBW(E)100198	Yolk	0.24	0.01	Guo R et al. (2023) [24]
	BCR CRM 380R	Whole milk	0.53	0.06	Sauzéat et al. (2021) [31]
	BCR -189	Whole meal flour	0.61	0.05	Costas-Rodriguez et al. (2013) [9]