

CERTIFICATE OF ANALYSIS

Thermo Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2015 by TUV SUD America Inc.
Certificate Number. 951001163

Catalogue Number	045483
Lot Number	R23L036
Description	Hafnium(IV) oxide, 99.995%, (metals basis excluding Zr), Zr typically <0.2%
CAS Number	12055-23-1
Quality Test/Release Date	27/May/2025
Suggested retest date	27/May/2030
Country of Origin	United States
Declaration of Origin	Synthetic

Result Name	Units	Specifications	Test Value
Impurity content	%	0.2% Zr max.	0.1551
Total Metal Impurities excluding Zr	%	0.005% max.	0.000768
Silver (Ag)	ppm	<0.5	<0.5
Aluminium (Al)	ppm	1	1
Arsenic (As)	ppm	<0.1	<0.1
Gold (Au)	ppm	<1	<1
Boron (B)	ppm	<0.05	<0.05
Bismuth (Bi)	ppm	<0.1	<0.1
Bromine (Br)	ppm	<0.1	<0.1
Calcium (Ca)	ppm	<3	<3
Cadmium (Cd)	ppm	<0.5	<0.5
Cerium (Ce)	ppm	0.05	0.05
Chlorine (Cl)	ppm	0.5	0.5
Cobalt (Co)	ppm	0.02	0.02
Chromium (Cr)	ppm	1.2	1.2
Cesium (Cs)	ppm	<0.05	<0.05
Copper (Cu)	ppm	0.1	0.1
Dysprosium (Dy)	ppm	0.2	0.2
Erbium (Er)	ppm	<0.01	<0.01
Europium (Eu)	ppm	<0.01	<0.01
Flourine (F)	ppm	<0.1	<0.1
Iron (Fe)	ppm	<5	<5
Gallium (Ga)	ppm	<0.05	<0.05
Gadolinium (Gd)	ppm	<0.01	<0.01
Germanium (Ge)	ppm	<0.1	<0.1
Mercury (Hg)	ppm	<0.05	<0.05
Holmium (Ho)	ppm	<0.01	<0.01
Iodine (I)	ppm	<0.01	<0.01
Iridium (Ir)	ppm	<0.05	<0.05
Potassium (K)	ppm	<0.05	<0.05
Lanthanum (La)	ppm	<1	<1
Lithium (Li)	ppm	<0.05	<0.05
Lutetium (Lu)	ppm	<0.1	<0.1
Magnesium (Mg)	ppm	1	1
Manganese (Mn)	ppm	0.65	0.65
Molybdenum (Mo)	ppm	<3	<3
Sodium (Na)	ppm	0.25	0.25
Niobium (Nb)	ppm	<0.3	<0.3
Neodymium (Nd)	ppm	<0.01	<0.01

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of the catalogue number listed above.

Nickel (Ni)	ppm	0.5	0.5
Osmium (Os)	ppm	<0.05	<0.05
Phosphorus (P)	ppm	<0.05	<0.05
Lead (Pb)	ppm	<0.1	<0.1
Palladium (Pd)	ppm	<0.005	<0.005
Praseodymium (Pr)	ppm	<0.01	<0.01
Platinum (Pt)	ppm	<1	<1
Rubidium (Rb)	ppm	<0.05	<0.05
Rhenium (Re)	ppm	<0.1	<0.1
Rhodium (Rh)	ppm	<0.01	<0.01
Ruthenium (Ru)	ppm	<0.01	<0.01
Sulfur (S)	ppm	0.1	0.1
Antimony (Sb)	ppm	<0.05	<0.05
Selenium (Se)	ppm	<0.5	<0.5
Tin (Sn)	ppm	<0.05	<0.05
Strontium (Sr)	ppm	1	1
Terbium (Tb)	ppm	<0.01	<0.01
Tellurium (Te)	ppm	<0.05	<0.05
Thorium (Th)	ppm	<0.1	<0.1
Titanium (Ti)	ppm	<1	<1
Thallium (Tl)	ppm	<0.05	<0.05
Thulium (Tm)	ppm	0.05	0.05
Uranium (U)	ppm	<0.1	<0.1
Vanadium (V)	ppm	0.66	0.66
Tungsten (W)	ppm	<4.2	<4.2
Yttrium (Y)	ppm	<0.3	<0.3
Zinc (Zn)	ppm	<0.05	<0.05

Additional Information Values given in ppm unless otherwise stated.



John Astarita
Director, Quality

Products are processed under ISO 9001:2015 quality management systems and samples are tested for conformance to the noted specifications. Certain data may have been supplied by third parties. We disclaim the implied warranties of merchantability and fitness for a particular purpose, and the accuracy of third-party data or information associated with the product. Products are for research and development use only. Products are not for direct administration to humans or animals. It is the responsibility of the final formulator or end user to determine suitability, and to qualify and/or validate each product for its intended use.

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