

## Stable isotopes of osmium available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Os-184	76	108	183.952491	0.02%	≥96.90%	Metal
Os-186	76	110	185.953838	1.59%	>99.00%	Metal
Os-187	76	111	186.955748	1.96%	>99.00%	Metal
Os-188	76	112	187.955836	13.24%	≥94.00%	Metal
Os-189	76	113	188.958145	16.15%	>99.00%	Metal
Os-190	76	114	189.958445	26.26%	>99.00%	Metal
Os-192	76	116	191.961479	40.78%	>99.00%	Metal

**76** Osmium was discovered in 1803 by Smithson Tennant. Its name derives from the Greek word *osme*, meaning “smell.”

**Os**

A bluish-white, lustrous, brittle and fairly hard metal of the platinum group, osmium has a close-packed hexagonal system. On heating in air, it gives off the poisonous fume of osmium tetroxide. It has the highest specific gravity and melting point of the platinum metals. It is metallurgically unworkable and has a magnetic susceptibility of  $0.052 \times 10^{-6} \text{ cm}^3/\text{g}$ . It is insoluble in water, HCl, H<sub>2</sub>SO<sub>4</sub> and ammonia; slightly soluble in nitric acid and *aqua regia*; and solubilized by fusion with caustic soda, sodium peroxide, potassium chlorate and the mass dissolved in water. In its finely divided form, it reacts slowly with oxygen or air at ambient temperatures to form osmium tetroxide. The bulk metal is stable in oxygen at ordinary temperatures but reacts at 200 °C, forming osmium tetroxide.

Osmium is stable in mineral acids, even under boiling conditions. The metal, however, is attacked by fused alkalis such as caustic soda and caustic potash, particularly in the presence of an oxidizing agent such as sodium peroxide, sodium hypochlorite or sodium nitrite, forming osmates.

The commercial applications of osmium are limited and considerably fewer than those of other platinum group metals. Its alloys are very hard and are used to make tips of fountain-pen nibs, phonograph needles and pivots. The metal also exhibits effective catalytic properties in hydrogenation and other organic reactions. Such catalytic applications, however, are limited; osmium fails to replace other noble metals, particularly palladium and platinum, which cost less and are more effective as catalysts.

## Properties of Osmium

<b>Name</b>	Osmium
<b>Symbol</b>	Os
<b>Atomic number</b>	76
<b>Atomic weight</b>	190.2
<b>Standard state</b>	Solid at 298 °K
<b>CAS Registry ID</b>	7440-04-2
<b>Group in periodic table</b>	8
<b>Group name</b>	Precious metal or platinum group metal
<b>Period in periodic table</b>	6
<b>Block in periodic table</b>	d-block
<b>Color</b>	Bluish-gray
<b>Classification</b>	Metallic
<b>Melting point</b>	3050 °C
<b>Boiling point</b>	5027 °C
<b>Vaporization point</b>	5300 °C
<b>Electrical resistivity</b>	9.50 $\mu\Omega\cdot\text{cm}$ at 20 °C
<b>Electronegativity</b>	2.2
<b>Specific heat</b>	0.131 kJ/kg K at 20 °C
<b>Heat of vaporization</b>	630.00 kJ·mol <sup>-1</sup> at 5027 °C
<b>Heat of fusion</b>	31.00 kJ·mol <sup>-1</sup>
<b>Density of liquid</b>	20.00 g/cm <sup>3</sup> at 3050 °C
<b>Density of solid</b>	22.48 g/cm <sup>3</sup>
<b>Electron configuration</b>	[Xe]4f <sup>14</sup> 5d <sup>6</sup> 6s <sup>2</sup>
<b>Oxidation states</b>	+1, +2, +3, +4, +5, +6, +7, +8
<b>Most common oxidation states</b>	+3, +4, +6
<b>Moh's hardness scale</b>	7.0