

# Rutherfordium

**Rf**

## ***General Information***

### **Discovery**

The two different isotopes of rutherfordium were discovered in 1964 and 1969 by various parties at Dubna, Moscow and Berkeley, California respectively.

### **Appearance**

Unknown, but probably metallic grey in appearance.

### **Source**

A transuranium element created by bombarding  $^{249}\text{Cf}$  with  $^{12}\text{C}$  nuclei.

### **Uses**

Unknown.

### **Biological Role**

None.

## **General Information**

Two separate groups have claimed to be the discoverers of the element, due to two differing isotopes. A synthetic element created via nuclear bombardment, few atoms have ever been made and the properties of rutherfordium are very poorly understood. It is a radioactive metal and is of research interest only.

## Physical Information

Atomic Number	104
Relative Atomic Mass ( $^{12}\text{C}=12.000$ )	261.11
Melting Point/K	2400 (estimated)
Boiling Point/K	5800 (estimated)
Density/kg m <sup>-3</sup>	23,000
Ground State Electron Configuration	[Rn]5f <sup>14</sup> 6d <sup>2</sup> 7s <sup>2</sup>
Electron Affinity (M-M <sup>-</sup> )/kJ mol <sup>-1</sup>	Not available

## Key Isotopes

Nuclide	<sup>253</sup> Rf	<sup>255</sup> Rf	<sup>256</sup> Rf	<sup>257</sup> Rf	<sup>258</sup> Rf	<sup>259</sup> Rf
Atomic mass				257.10	258.10	259.11
Natural abundance	0%	0%	0%	0%	0%	0%
Half-life	1.5 secs	1.4 secs	7x10 <sup>-3</sup> secs	4.8 secs	0.013 secs	3.0 secs
Nuclide	<sup>260</sup> Rf	<sup>261</sup> Rf	<sup>262</sup> Rf			
Atomic mass	260.11	261.11				
Natural abundance	0%	0%	0%			
Half-life	0.020 secs	65 secs	0.047 secs			

## Ionisation Energies/kJ mol<sup>-1</sup>

M - M <sup>+</sup>	490 (est)
M <sup>+</sup> - M <sup>2+</sup>	
M <sup>2+</sup> - M <sup>3+</sup>	
M <sup>3+</sup> - M <sup>4+</sup>	
M <sup>4+</sup> - M <sup>5+</sup>	
M <sup>5+</sup> - M <sup>6+</sup>	
M <sup>6+</sup> - M <sup>7+</sup>	
M <sup>7+</sup> - M <sup>8+</sup>	
M <sup>8+</sup> - M <sup>9+</sup>	
M <sup>9+</sup> - M <sup>10+</sup>	

## Other Information

Enthalpy of Fusion/kJ mol<sup>-1</sup> Not available

Enthalpy of Vaporisation/kJ mol<sup>-1</sup> Not available

### Oxidation States

Rf<sup>IV</sup> has been predicted as the most stable.

### Covalent Bonds/kJ mol<sup>-1</sup>

Not available