

## Physical Properties of the Platinum Group Metals<sup>1</sup>

Property	Units	Ru	Rh	Pd	Os	Ir	Pt
Atomic Number	-	44	45	46	76	77	78
Atomic Weight	-	101.07	102.9055	106.4	190.2	192.22	195.09
Crystal Structure <sup>a</sup>	-	HCP	FCC	FCC	HCP	FCC	FCC
Lattice Constants a c	nm nm	0.27058 0.42819	0.38031	0.38898	0.27341 0.43197	0.38394	0.39231
Atomic Radius	nm	0.133	0.134	0.138	0.134	0.136	0.139
Density at 25°C	g·cm <sup>-3</sup>	12.45	12.41	12.02	22.61	22.65	21.45
Density at Melting Point	g·cm <sup>-3</sup>	10.9	11.1	10.5	20.1	20.0	19.8
Melting Point	°C	2310	1960	1554	3050	2443	1769
Boiling Point	°C	3900	3730	3125	5500	4500	3825
Ionization Potentials - 1st	ev	7.36	7.46	8.33	8.7	9.6	9.0
2nd	ev	16.8	18.07	19.42	17	—	18.56
3rd	ev	28.46	31.05	32.92	—	—	28.5
4th	ev	—	—	48.8	—	—	41.1
Vapor Pressure at 3000°C (est)	nm	4.1	5.17	—	0.0195	0.541	—
Specific heat at 0°C	J/K/mole	24.095	24.941	25.929	—	25.121	25.958
Thermal Conductivity 0-100°C	Watt/m°C	105	150	76	87	148	73
Linear Coefficient of Thermal Expansion	°C <sup>-1</sup>	—	8x10 <sup>-6b</sup>	11.67x10 <sup>-6c</sup>	5x10 <sup>-6b</sup>	—	8.9x10 <sup>-6c</sup>
Electrical Resistivity	μΩ·cm	6.80	4.33	9.33	8.12	4.71	9.85
Temperature Coefficient of Resistance (0-100°C)	Ω·°C <sup>-1</sup>	0.0042	0.0046	0.0033	0.0042	0.0043	0.003
Hardness (Annealed - Vicker Hardness Number)	—	220	101	41	>250	220	41
Tensile Strength (Annealed)	ton·in <sup>-2</sup>	36	45	11	—	71	9

<sup>a</sup>HCP = hexagonal close packed; FCC = face centered cubic  
<sup>b</sup>at 0°C  
<sup>c</sup>at 25°C

<sup>1</sup> *Chemistry of the Platinum Group Metals*, ed. Frank R. Hartley (Oxford: Elsevier, 1991) 21-22.