Common Properties - Tungsten Carbide

Lattice type	hexagonal Bh, WC-type
Lattice parameter	a= 0.2906 - 0.29006 nm
	c= 0.2864 - 0.28374 nm
Homogeneity range	WC exhibits a very narrow homogeneity range and is practically stoichiometric.
Density	
measured	15.7 g/cm³
X-ray	15.77 g/cm³
Hardness	Inherent to its hexagonal structure, WC single crystals exhibit a pronounced hardness anisotropy; the room-temperature Knoop hardness of the basal plane (0001) varies from 2200 to 2500, depending on the direction of the long diagonal axis of the indenter, and of the prism planes between only 1000 in the [0001] direction to 2500 perpendicular to this direction the hardness anisotropy prevails at least up to 900 °C; for polycrystalline WC the hardness increases with decreasing grain size (Hall-Petch relationship); for fine-grained WC it is in the range of 2400-2800 kg/mm² (HV30)
Modulus elasticity	670 - 707 GPa
Shear modulus	262 - 298 GPa
Compressive modulus	384 GPa
Plasticity	WC exhibits a pronounced plasticity; the formation of slip bands can be observed in the vicinity of hardness indentations or on compressive testing; the prism planes are the slip planes (1010), and the slip directions are both 1120 and 0001 ; the plasticity of WC is an important aspect for its use as hard component in hardmetals.

	WC is significantly tougher than other, covalent hard compounds (fracture toughness: 6-7 $MN/m^{3/2}$), which contributes to the comparatively high fracture toughness of the WC-Co composite.
Surface energy	1.7 J/m^2
$-D H^{\circ}_{298}$	40.4 kJ/mol
Linear coefficient of thermal expansion	5.2 x 10^{-6}/K (a -axis)
	7.3 x 10^{-6}/K (*c*-axis)
Electrical resistivity	17-25 $\mu\Omega \cdot cm$
Thermal conductivity	1.2 J/(cm.s.K)
Magnetic susceptility	0.005x$10^{-6}$$cm^3/g$
Superconductivity critical temperature	10 K

Source: E.Lassner and W.D.Schubert, TUNGSTEN: properties, chemistry, technology of the element, alloys and chemical compounds, ISBN 0-306-45053-4, Kluwer Academic / Plenum Publishers, New York (1990).