

CRITICAL & STRATEGIC MINERALS

The alloying and strategic feedstock that make superalloys and specialty steels possible — niobium, cobalt, hafnium, vanadium, rhenium and tantalum. Several are supply-concentrated critical minerals; rhenium and hafnium in particular enable single-crystal turbine-blade superalloys. Supplied as ingot, cathode, cut pieces, pellet and powder for melt and alloying operations.

Refractory / Strategic

Refractory and strategic metals used as superalloy and specialty-steel additions and for specialised end-use (superconductors, batteries, single-crystal blades). Supply is concentrated — strategic sourcing matters.

Grade	Nominal composition (wt %)	UTS / YS / El (MPa, %)	Key properties & applications
Niobium / Nb-1Zr / FeNb <i>Columbium</i> To-order	Nb >= 99 (Nb-1Zr: +1 Zr); FeNb 60-70% Nb	UTS 275-550 / YS - / El 20-30% ρ 8.57 g/cm ³ 80 HV Tmax 1100°C	Superconducting & superalloy-strengthening; FeNb is the key superalloy/HSLA addition Forms: Ingot, Bar, Sheet, Wire, Powder, FeNb lump Use: Superalloy & HSLA additions, superconductors, chemical
Cobalt / Hafnium / Vanadium / Rhenium <i>Strategic elements</i> To-order	Co, Hf, V, Re (>= 99.9 typical)	UTS - / YS - / El -% ρ Co 8.9 / Hf 13.3 / V 6.1 / Re 21.0 g/cm ³	Critical superalloy & specialty additions; Re & Hf enable single-crystal turbine blades; supply-concentrated Forms: Cathode, Cut pieces, Ingot, Pellet, Powder Use: Superalloy alloying (single-crystal blades), tool steel, batteries

Forms by industry —

Aerospace: Bar, sheet, powder, feedstock — superalloy additions, rocket, superconductors

Automotive: FeNb, feedstock — HSLA micro-alloying, batteries (Co)

Oil & Gas: Bar, feedstock — chemical, wear/hot-section alloying