Group 5 / VB; Vanadium Group

Basics

- Vanadium (V), Niobium (Nb) and tantalum (Ta) are important metals that are not all that rare.
  - Tantalum has been seen as critical since it was linked to the ongoing war in the Congo, a source of the mineral group known as "coltan". Wrongly, tantalum was and is described as crucial for silicon microchip technology. It is actually important for so-called tantalum (or better tantalum oxide) capacitors, which are indeed crucial for electronics but not relalted to silicon technology.

  - Vanadium, Niob und Tantal sind wichtige und realtiv häufig vorkommende Elemente; Hahnium ist künstlich erzeugt. Alle Elemente sind technisch wichtig ("Tantalkondensator), insbesondere als Legierungsbestandteile. **Nb** war (und wahrscheinlich ist) ein Hauptbestandteil von technisch eingesetzten Supraleitern.
  - Niobium and vanadium are improtant alloy elements for steel. Vanadium is also held responsible for the "water pattern" in wooth steel.
- *Table of Basic Data*

Name *(German)*	**Vandium** *Vandium*	**Niob** *Niobium*	**Tantal** *Tantalum*
Atomic number	23	41	73
Atomic mass [u]	50,9415	92,90638	180,9479
Melting point [K]	2163	2741	3269
Melting point [^{o}C]	1890	2468	2996
Melting point [^{o}F]	3434	4474	5425
Boiling point [K]	3653	5200	5698
Density [g/cm^{3}]	6,09	8,58	16,68
Ionization energy [eV]	6,74	6,88	7,89
Electro-negativitiy	1,5	1,2	1,4
Atomic radius [pm]	132,1	142,9	143
Ionic radius [pm]	59	69	64
Oxidation numbers	5 bis -3	5 bis -1	5 bis -1
Lattice typ **Transformation temp. [^{o}C]**	bcc -	bcc -	bcc -
Therm. expansion coefficient α **Lattice constant [Å]** **(a or c)**	3,03	3,30	3,30
Young's - Modul us [GPa]	127	104	175
[10^{-6}K^{-1}]	7,8	7,1	3,6

- In case of doubt all numbers are for room temperatures
- fcc = face centered cubic; lattice const. = a
  bcc = body centered cubic

sc = simple cubic
hp = simple hexagonal
hcp = hexagonal close packed; lattice constants a and c.
op = simple orthorhombic, monoclinic, triclinic
tp = simple tetragonal
dia = diamond structure
r = trigonal or rhomboedral trigonal