Group 12 / IIB; Titanium Group

Basics

The titanium (Ti) family containswhat one might call "High-Tech" metals.

- Noting need to be said to titanium, except that it is expensive. Not because it is rare (it is not) but because it is difficult to make.
  Metallic zirconium (Zr) is essential in nuclear power plants and its oxide, zirconia, is a key material for modern ceramic applications.
  Hafnium oxide not so long ago became a key ingredient in modern microelectronic circuits.

Table of Basic Data

Name *(German)*	**Titan** *Titanium*	**Zirkonium** *Zirconium*	**Hafnium** *Hafnium*
Atomic number	22	40	73
Atomic mass [u]	47,88	91,224	178,49
Melting point [K]	1933	2125	2423
Melting point [^{o}C]	1660	1852	2150
Melting point [^{o}F]	3020	3366	3902
Boiling point [K]	3533	4650	5673
Density [g/cm^3]	4,51	6,51	13,31
Ionization energy [eV]	6,82	6,84	7,0
Electronegativitiy	1,3	1,2	1,2
Atomic radius [pm]	144,8	160	156,4
Ionic radius [pm]	61	87	84
Oxidation numbers	4, 3, 2	4, 3, 2, 1	4, 3, 1
Lattice typ **Transformation temp. [^{o}C]**	bcc 885 hcp	bcc 852 hcp	bcc 131 hcp
Lattice constant [Å] **(a or c)**	2,95 4,73	3,23 5,15	3,20 5,06
Young's - Modul us [GPa]	106	92,2	138
Therm. expansion coefficient α **[$10^{-6}K^{-1}$]**	10	7,2	(6,0)

- 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