Group 13 / IIIA; Boron Group

Basics

An old name for this group was "earth metals" since they have some similarities to the alkali metals. The technical importance of aluminum is clear. It is, by the way, the most prominent metal in the earth's crust but not easy to make by "smelting".

- Without boron (B) as doping element in silicon (Si) there would be no microelectronics but the major use of boron is in the glass industry. Boron is also used as alloying element in steel. Boron nitride (BN) is just as hard as diamond and thus finds uses.

- Gallium (Ga) and Indium (In) are prominent in so-called III-V semiconductors indispensable for optoelectronics (e.g. Lases and LED's). Indium, in particular is also needed in quantities for making "ITO", short for indium-tin-oxide, the material of choice if you need a light-transparent conductor, e.g. for flat-panel displays or some kinds of solar cells.
  Thallium (Tl) and its compounds are poisonous and thus not used much.

Table of Basic Data

Name *(German)*	**Boron** *Bor*	**Aluminum** *Aluminium*	**Gallium** *Gallium*	**Indium** *Indium*	**Thallium** *Thallium*
Atomic number	5	13	31	49	81
Atomic mass [u]	10,81	26,98	69,72	114,82	204,38
Melting point [K]	2573	933,52	302,93	429,32	576,7
Melting point [^{o}C]	2300	660,52	29,93	156,32	303,7
Melting point [^{o}F]					
Boiling point [K]	2823	2740	2676	2353	1730
Density [g/cm^3]	2,46	2,70	5,91	7,31	11,85
Ionization energy [eV]	8,30	5,97	6,0	5,79	6,11
Electronegativitiy	2,0	1,5	1,8	1,5	1,4
Atomic radius [pm]	83	143,1	122,1	162,6	170,4
Ionic radius [pm]	23	57	62	92	149
Oxidation numbers	3	3	3, 2, 1	3, 2, 1	3, 1
Lattice typ **Transformation temp. [^{o}C]**	op	fcc	op	tp	fcc 232 hcp
Lattice constant [Å] **(a or c)**	8,93 5,06	4,04	? ?	4,59 4,94	3,45 5,52
Young's - Modul us [GPa]	?	70,5	(9,8)	10,5	8,0
Therm. expansion coefficient α **[10^{-6}K^{-1}]**	2,3	23,3	18	40	29

- 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