PROPERTIES OF THE GROUP 13 ELEMENTS

	B	Al	Ga	In	Tl
Melting point (°C)	2300	660.37	29.77	156.61	303.5
Boiling point (°C)	2550	2467	2403	2080	1457
Density (g/cm^3)	2.34	2.702	5.904	7.31	11.85
Ionization energy (kJ/mol)	801	578	579	558	589
Atomic radius (pm)	85	143	135	167	170
Ionic radius (pm)	—	54	62	80	89
Common oxidation number in compounds	+3	+3	+1, +3	+1, +3	+1, +3
Crystal structure	monoclinic	fcc	orthorhombic	fcc	hcp
Hardness (Mohs' scale)	9.3	2.75	1.5	1.2	1.2

APPLICATION *Technology*

Aluminum

Chemically, aluminum is much more active than copper, and it belongs to the category of *self-protecting metals*. These metals are oxidized when exposed to oxygen in the air and form a hard, protective metal oxide on the surface. The oxidation of aluminum is shown by the following reaction.

$$4Al(s) + 3O_2(g) \longrightarrow 2Al_2O_3(s)$$

This oxide coating protects the underlying metal from further reaction with oxygen or other substances. Self-protecting metals are valuable in themselves or when used to coat iron and steel to keep them from corroding.

Aluminum is a very good conductor of electric current. Many years ago, most high-voltage electric power lines were made of copper. Although copper is a better conductor of electricity than aluminum, copper is heavier and more expensive. Today more than 90% of high-voltage transmission lines are made of relatively pure aluminum. The aluminum wire does not have to be self-supporting because steel cable is incorporated to bear the weight of the wire in the long spans between towers.

In the 1960s, aluminum electric wiring was used in many houses and other buildings. Over time, however, because the aluminum oxidized, Al_2O_3 built up and increased electric resistance at points where wires connected to outlets, switches, and other metals. As current flowed through the extra resistance, enough energy as heat was generated to cause a fire. Though some homes have been rewired, aluminum wiring is still prevalent in many homes.

These high-voltage transmission lines are made of aluminum supported with steel cables.