substance: boron compounds, general properties
property: orthorhombic γ-AlB_{12} structure group

A bilayered sheet of B_{12} icosahedra comprised of a kagomé layer of interconnected B_{48} (T_d) units is the basic structural layer in the framework of γ-AlB_{12}. The B_{48} is composed of four crystallographically independent B_{12} icosahedra. The B_{12} icosahedral framework can also be described by a B_{144} subunit, in which 12 interbonded icosahedra define the vertices of a regular truncated tetrahedron [77H, 83H]. The Al atoms are distributed among 11 sites, none of which is fully occupied. Each of the sites is enclosed by 10 to 14 boron atoms. The distances vary in relative wide ranges; the five shortest Al-B distances (2.03 to 2.09 Å) are less than the sum of the covalent radii (Al: 1.26 Å; B: 0.94 Å) (Fig. 1).

Pure γ- AlB_{12} crystals can only be prepared intergrown with α-AlB_{12} [99H1, 99H2] (For more details, see below).

Representatives of the γ-AlB_{12} structure group

Chemical formula	Structural formula (idealized)	
γ-AlB_{12}	$(B_{12})_4B_{20}{\cdot}B_{20}Al_{6.66}$	87L, 77H, 77K, 86H, 83H, 94W
$Al_{1.42}Mg_{0.45}B_{22}$		87H1, 87L
$Al_{1.44}Mg_{0.65}B_{22}$		87H1, 87H2, 87L
$Al_{1.0}Si_{0.7}B_{15.6}$		87G

The electronic properties, which have become known, indicate semiconducting behavior.

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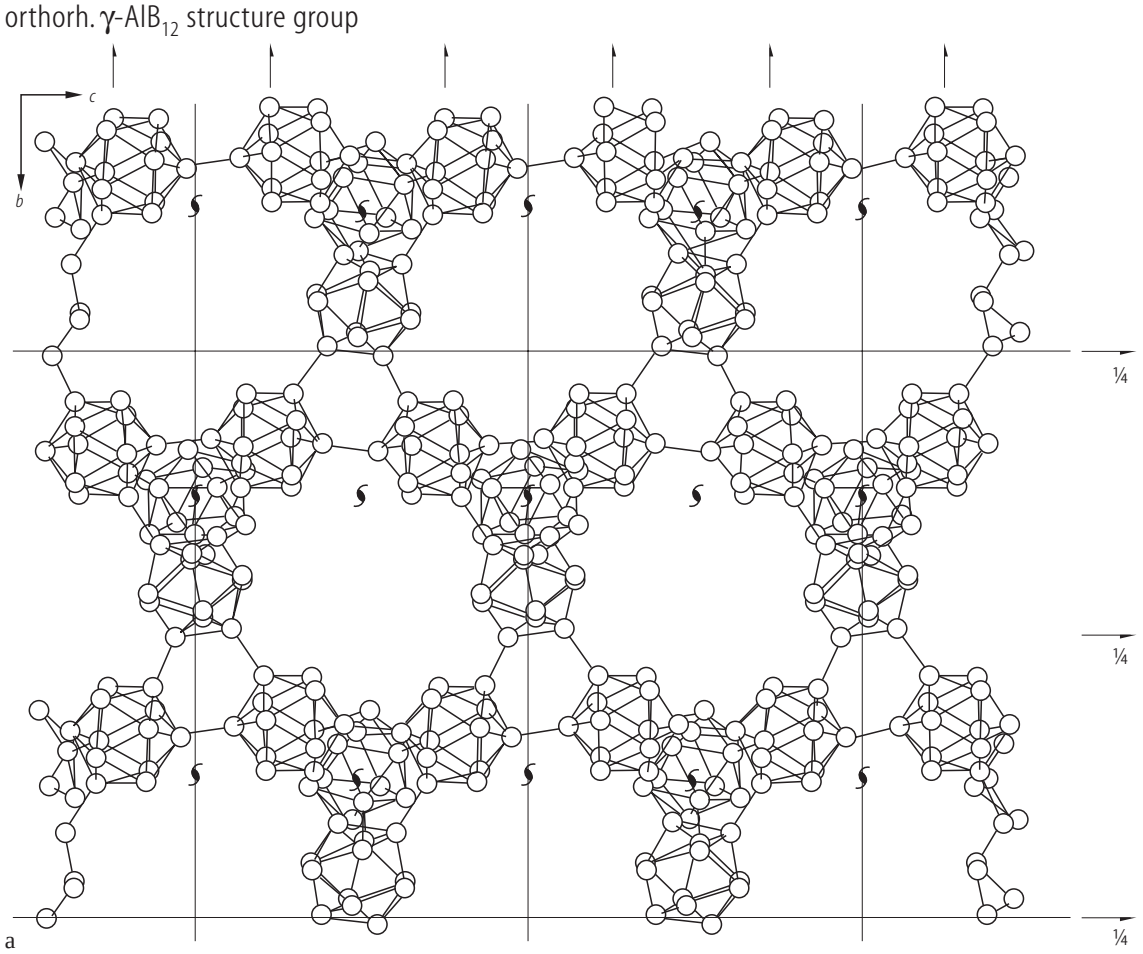
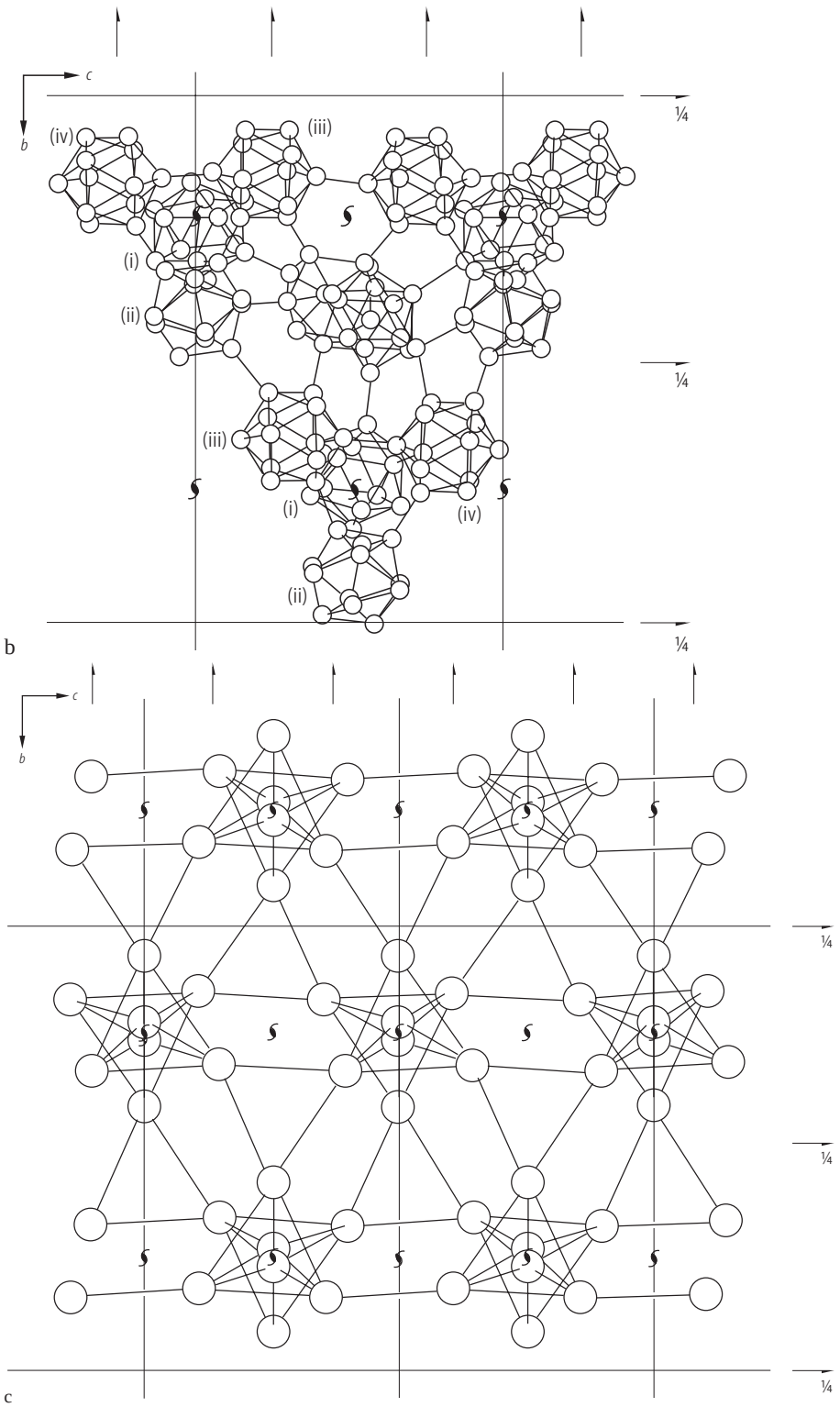
Fig. 1.

Orthorhombic γ-AlB_{12} structure group. Structure in a view parallel to [100]; **(a)** B_{12} icosahedral arrangement, **(b)** features of the linkages between a $B_{20}(C_2)$ unit and B_{12} icosahedra, **(c)** arrangement of the $B_{48}(T_d)$ subunit showing B_{144} (T_d) and truncated tetrahedral holes (the circles represent B_{12} icosahedra) [83H]. For stereoscopic views of the $B_{20}(C_2)$ and $B_{20}(C_3)$ units and of the coordination of the metal sites to the boron framework see [83H].

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