substance: boron compounds with group IIa elements
property: properties of Al-Bcompounds: AlB_2, AlB_4, AlB_{10}

AlB_2

semiconducting or metallic (?); preparation [56F, 79S], crystalline structure [75S, 76S, 77L], electronic structure [77S, 77P], thermal and electrical conductivity [77C, 75S]

Structure: hexagonal

Space group: D_{6h}^1 [77P].

Refinement of the aluminum diboride crystal structure in [99B]:

Structure: hexagonal

Space group: P6/mmm

lattice parameters
(in Å)

a	3.004(2)	*T* = 300 K	X-ray diffraction	87K
c	3.246(2)			
a	3.0043(3)	*T* = 300 K	single crystal X.ray diffraction	99B
c	3.2519(6)			

electronic properties

Density of states calculation in [86B1].

resistivity

ρ	31...77 μΩ cm	*T* = 300 K	77C, 72S

Hall constant

R_H	$1.5...10 \cdot 10^{-4}$ $cm^3\ C^{-1}$	72S

entropy

S	31.4(21) J $mol^{-1}K^{-1}$	86B2

AlB_4

preparation [75S]

AlB_{10}

preparation [60K, 79S], crystalline structure [60K, 79S, 70W, 77M], thermal properties [75S]

orthorhombic structure

lattice parameters
(in Å)

a	8.881	*T* = 300 K	58K,
b	9.100		63W
c	5.690		

electrical conductivity

σ	$5 \cdot 10^{-6}$ $\Omega^{-1}cm^{-1}$	*T* = 300 K	94G

rhombohedral structure (hexagonal presentation)

lattice parameters

a	7.835 Å	63W,
c	15.910 Å	69W

energy gap

E_g	1.8 eV	obtained from electrical conductivity	94G

electrical conductivity

σ	10^{-12} $\Omega^{-1}cm^{-1}$	T = 300 K	94G

Temperature dependence of the electrical conductivity of films (deposited at 600 K), before and after annealing in Fig. 1 [91G].

Temperature dependence of the electrical conductivity of films (deposited at 600 K) in the transition range of the amorphous to the crystalline (hexagonal) phase in Fig. 2 [91G].

density of states at the Fermi level

$g(E_F)$	< 10^{16} $eV^{-1}cm^{-3}$	94G

amorphous structure

obtained by thermal evaporation of a B + Al_2O_3 mixture at 1650...1700 K [94G].

energy gap

E_g	1.2 eV	obtained from electrical conductivity	94G

Temperature dependence of the electrical conductivity in Fig. 2 [91G].

References:

56F Felten, E. J.: J. Am. Chem. Soc. 78 (1956) 5977.

58K Kohn, J.A., Katz, G., Giardini, A.A.: Z. Kristallogr. 111 (1958) 53.

60B Binder, I., La Placa, S., Post, B., in: Boron I, J. A. Kohn, W. F. Nye, G. K. Gauld, eds., Plenum Press: New York, 1960 p. 86.

60K Kohn, J. A.: see [60B], p. 75.

63W Will, G.: J. Am. Chem. Soc. 85 (1963) 2335.

69W Will, G.: Z. Kristallogr. 128 (1969) 156.

70E Economy, J., Matkovich, V. I.: Boron 3, T. Niemyski, ed., PWN Warsaw, 1970 p. 159.

70W Will, G.: see [70E], p. 119.

72S Sirtl, E., Woerner, L.M.: J. Cryst. Growth 16 (1972) 215.

75S Samsonov, G. V., Serebryakova, T. I., Neronov, V. A.: Boridy, Moskva Atomizdat, 1975.

76S Spear, K. F.: J. Less-Common Met. 47 (1976) 197.

77B Berezin, A. A., Golikova, O. A., Zaitsev, V. R., Kazanin, M. M., Orlov, V. M., Tkalenko, E. N., in:Boron and Refractory Borides, (Matkovich V. 1., ed.) Springer: Berlin, Heidelberg, New York 1977, p. 52.

77C Castaing, J., Costa, P.: in: Boron and Refractory Borides, V.I. Matkovich ed., Springer: Berlin, Heidelberg, New York, 1977, p. 390.

77L Lundström, T.: see [77B], p. 351.

77M Matkovich, V. I., Economy, J.: see [77B], p. 96.

77P Perkins, P. G.: see [77B], p. 31.

77S Samsonov, G. V., Kovenskaya, B. A.: see [77B], p. 5.

79S Samsonov, G. V., Neronov, V. A., Lamikhov, L. K.: J. Less-Common Met. 67 (1979) 291.

86B1 Bullett, D.W.: in: Boron-Rich Solids (AIP Conf. Proc. 140), Albuquerque, New Mexico 1985, D. Emin, T.L. Aselage, C.L. Beckel, I.A. Howard ed., American Institute of Physics: New York, 1986, p. 249.

86B2 Borovikova, M.S., Fesenko, V.V.: J. Less-Common Met. 117 (1986) 287. (Proc. 8th Int. Symp. Boron, Borides, Carbides, Nitrides and Rel. Compounds, Tbilisi, Oct. 8 - 12, 1984)

87K Kisly, P.S., Prikhna, T.A., Goutar, N.A., Podarevskaya, O.V.: in: Proc. 9th Int. Symp. Boron, Borides and Rel. Compounds, University of Duisburg, Germany, Sept. 21 - 25, 1987, H. Werheit ed., University of Duisburg: Duisburg, 1987, p. 273.

91G Golikova, O.A., Kazanin, M.M., Mirzazhonov, Z., Khomodov, T., Shiyanov, Yu.A.: in: Boron-Rich Solids, Proc. 10th Int. Symp. Boron, Borides and Rel. Compounds, Albuquerque, NM 1990 (AIP Conf. Proc. 231), D. Emin, T.L. Aselage, A.C. Switendick, B. Morosin, C.L. Beckel ed., American Institute of Physics: New York, 1991, p. 117.

94G Gosset, D., Kryger, B., Verdeau, C., Froment, K: Proc. 11th Int. Symp. Boron, Borides and Rel. Compounds, Tsukuba, Japan, August 22 - 26, 1993, Jpn. J. Appl. Phys. Series 10 (1994), p. 188.

99B Burkhardt, U., Grin, Yu.: J. Solid State Chem. (2000) (Proc. 13th Int. Symp. Boron, Borides and Rel. Compounds, Dinard, France, Sept. 1999).

Fig. 1.

AlB_{10}. Temperature dependence of the electrical conductivity of films (deposited at 600 K), before (*1*) and after (*2*) annealing [91G].

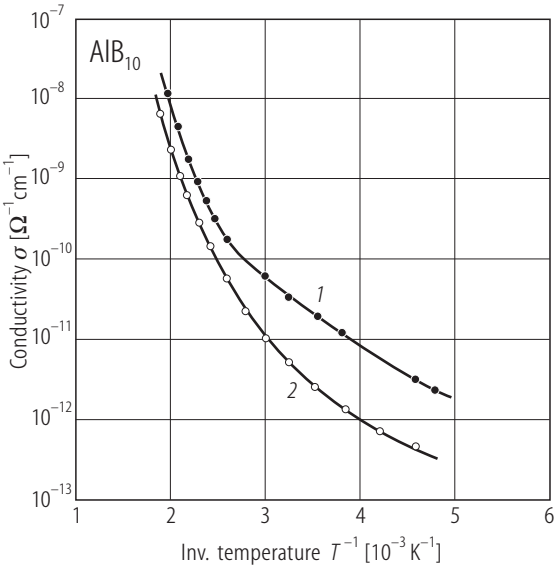

Fig. 2.

AlB_{10}. Temperature dependence of the electrical conductivity of films (deposited at 600 K) in the transition range of the amorphous (*1*) to the crystalline (hexagonal) (*2*) phase [91G].