substance: boron compounds with group III elements
property: properties of Al-B compounds: AlB_{31}, $AlBeB_{22}$

AlB_{31}

Solid solution of Al in β-rhombohedral boron

Interstitially doped β-rhombohedral boron, see Landolt-Börnstein III/41C "Boron".

$AlBeB_{22}$

Depending on the initial atomic ratio Be/B (1/4 to 1/24) in the aluminium solvent the following compounds were obtained: $Al_{0.83}Be_{0.88}B_{22}$, $Al_{1.0}Be_{0.97}B_{22}$, $Al_{0.83}Be_{0.82}B_{22}$, $Al_{0.8}Be_{0.95}B_{22}$, $Al_{0.71}Be_{1.40}B_{22}$ [91D].

lattice parameters
(in Å)

a	10.171	*T* = 300 K	$Al_{1.0}Be_{0.97}B_{22}$, X-ray diffraction	91D,
c	14.233			87G1
a	10.170(3)		$Al_{1.1}Be_{0.7}B_{22}$, X-ray diffraction	93H,
c	14.250(3)			80H
a	10.174(1)		$Al_{1.2}Be_{0.5}B_{22}$, X-ray diffraction	93H,
c	14.235(6)			80H
a	10.257	*T* = 300 K	$Al_{0.8}Be_{0.95}B_{22}$, X-ray diffraction	87G1
c	14.308			
a	10.162	*T* = 300 K	$Al_{1.1}Be_{0.4}B_{22}$, X-ray diffraction	87G1
c	14.265			

energy gaps ($Al_{1.2}Be_{0.5}B_{22}$), redetermined from the original data in [87H]
(in eV)

E_g	0.91(5)	*T* = 300 K	deep level	
	1.04(2)		indirect allowed or non-direct	87H
	1.60(3)		indirect allowed or non-direct	
	1.734		indirect allowed or non-direct	
	1.804		indirect forbidden	
	1.89(3)		indirect forbidden	
	1.98(2)		indirect allowed	

Absorption edge of $Al_{1.2}Be_{0.5}B_{22}$ [87H] and $Al_{0.9}Be_{0.1}B_{12}$ [87G2] in Fig. 1.

IR active phonon wavenumbers

(ν/c in cm^{-1})

ν/c	1148	T = 300 K	$Al_{1.2}Be_{0.5}B_{22}$ obtained from the original data of the spectrum in Fig. 2	94W
	1135			
	1052			
	1023			
	975			
	949			
	929			
	888			
	860			
	802			
	784			
	759			
	705			
	691			
	647			
	603			
	592			
	572			
	554			
	515			
	502			
	477			
	446			
	420			
	386			
	371			
	328			
	315			
	300			
	286			
	226			
	184			
	146			

IR Phonon absorption spectrum of $Al_{1.2}Be_{0.5}B_{22}$ in Fig. 2 [87H].

$AlBeB_{22}$ (doped with Eu)

(actual composition $Al_{1.1}Be_{0.40}B_{22}$ + 0.1 wt.% Eu)

Eu addition reduces the relative (Al+Be)/B ratio of the crystals considerably from about 1.97/22 to 1.50/22 [87G1].

lattice parameters

a	10.162 Å	T = 300 K	X-ray diffraction	87G1
c	14.265 Å			

References:

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87G1 Gurin, V.N., Korsukova, M.M., Kuz'ma, Yu.B., Chaban, N.F., Nechitailov, A.A., Haupt, H., Werheit, H.: 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. 275.

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87H Haupt, H., Werheit, H., Siejak, V., Kannengiesser, U., Higashi, I.: 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. 385.

91D Derkhachenko, L.I., Gurin, V.N., Korsukova, M.M., Nechitailov, A.A., Nechitailov, A.P., Kuz'ma, Yu.B., Chaban, N.F.: 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. 451.

93H Hori, A., Kimura, K., Tada, T., Yamashita, H.: J. Non-Cryst. Solids 153&154 (1993) 308.

94W Werheit, H., Krach, G., Kuhlmann, U., Higashi, I., Gurin, V.N., Korsukova, M.M.: Proc. 11th Int. Symp. Boron, Borides and Rel. Compounds, Tsukuba, Japan, August 22 - 26, 1993, Jpn. J. Appl. Phys. Series 10 (1994), p. 96.

Fig. 1.

$Al_{1.2}$ $Be_{0.5}$ B_{22}. Absorption edge; absorption coefficient α vs. photon energy [87H]; open circles, $Al_{0.9}Be_{0.1}B_{12}$ (scaling of the ordinate as assumed to be correct because in the original paper it is obviously incorrect) [87G2].

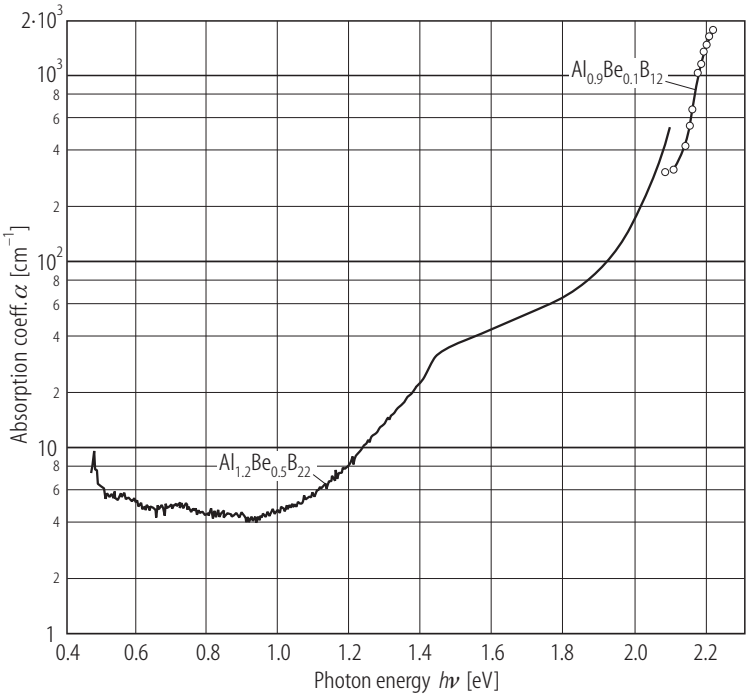

Fig. 2.

α-AlB_{12} and $Al_{1.2}$ $Be_{0.5}$ B_{22}. Phonon absorption spectra. Absorption index vs. wavenumber [94W].