

substance: boron compounds, general properties

property: general papers on icosahedral boron-rich solids

Structures of boron and some boron-rich compounds [69S1, 69S2]

Boron and boron-rich compounds [99W]

Icosahedral boron-rich solids [87E2].

Icosahedral borides and amorphous boron. [92G].

Icosahedral boron rich solids as very high temperature semiconductors [87E2].

Icosahedral boron-rich solids as refractory semiconductors [87E1].

Quasiamorphous semiconductors [89G2].

Metallic-covalent bonding conversion in aluminum-based and boron-based icosahedral cluster solids [97K1].

On the sensitivity of spectroscopic and electrical investigations of structural and preparatory influences on the properties of icosahedral boron-rich solids [91W2].

Interrelation between icosahedral aluminium-based quasicrystals and boron-rich solids [95K].

Preparation and structure

Crystal growth of icosahedral B₁₂ compounds from high-temperature metal solutions [90H2].

Ion implantation in boron: remarkable stability of covalent structures based on icosahedra [91S].

Structure, defects and properties of some refractory borides [85L].

Preparation of icosahedral boride semiconductors [87A].

Modeling of the structure of amorphous semiconductors [87G1].

Investigations on the ternary system Al-B-C [99H].

Growth of icosahedral boron-rich clusters at high pressure in [98M].

High-pressure, high-temperature synthesis of superhard α -rhombohedral boron-rich solids in the B-C-N-O system [98H].

Electronic properties

Symmetry analysis of the electronic structure of polyhedron clusters M₁₂ (I_h), M₁₂ (O_h) and M₆₀ (I_h) [91W1].

Semiconductors with complex lattice and the amorphization problem in [87G2].

Quasiamorphous semiconductors (in russian) [89G1].

The dynamic effective charges of icosahedral boron by the Bond-Charge Model [96S1].

On the electronic properties of icosahedral quasicrystals [96W1].

Electronic structures of icosahedral boron solids [90H1].

An isotopic disorder as a possible cause of the intrinsic electronic localization in some materials with narrow electronic bands [84B].

Mössbauer study of boron-rich phases doped with Fe [91G].

A study of negative force constants, contribution of the Jahn-Teller effect [97S4].

Jahn-Teller effect of the B₁₂ icosahedron and its general influence on the valence band structures of boron-rich solids [90F, 90W, 91F].

Superconductivity and magnetism of the pseudoternary rare earth boride systems $R(\text{Rh}_{1-x}\text{Co}_x)\text{B}_4$ ($R = \text{Lu}, \text{Er}, \text{Ho}$) [87K].

Bipolaron formation in icosahedral and octahedral borides [98E].

Solid state properties determined by electronic states in icosahedral clusters of group III elements [99K].

Impurities and defects

Detection possibility of doping atoms (C and Al) in B_{12} -based solid clusters by high-resolution electron microscopy [99O].

Lattice properties

The basis functions and the matrix representations of the single and double icosahedral point group [92S1].

On the normal vibrations of the icosahedral boron molecule B_{12} [92S2].

Vibrations of regular boron icosahedra [86B].

The polar vibrations and the effective charges of the icosahedral boron solids [96S2].

The IR and Raman activities of the icosahedral molecule [96S1].

Vibrational properties of boron and boron-rich compounds [86W].

Structure and bulk modulus of high-strength boron compounds [97L].

Central and noncentral forces on the lattice dynamics of boron-rich solids [97S2].

Origin of the homology of lattice vibrations of icosahedral structures [86R].

The effects of special geometries of boron-rich crystals on the lattice dynamics [99S].

Transport properties

Energy transfer processes in non-ohmic hopping conductivity in a strong electric field [83B].

Electronic transport in icosahedral boron-rich solids [87E3].

Pair breaking in semiclassical singlet small-bipolaron hopping [96E].

Bipolarons in boron icosahedra [87H2, 87H3].

Bipolarons in boron-rich icosahedra [87H1].

Electron transport in boron-rich borides [87G3].

Optical properties

Optical properties of large and small polarons and bipolarons [93E].

Optical properties of quasicrystalline approximant boron-rich solids [93H].

Structure-modulated reflectivity spectra of icosahedral boron-rich solids [96W2].

Further properties

Thermal properties of boron, boron carbides, B_{12}As_2 and YB_{66} [86T].

The elastic properties and the mechanical stability of boron-rich solids [97S3].

The rotation-induced relaxation mechanism for strains: application to boron-rich crystals [97S1].

Applications

Thermistor properties of boron and its compounds [80G].

Boron-based high temperature thermoelectric materials [83R, 84S].

High-temperature thermoelectric energy conversion I [84W2].

High-temperature thermoelectric energy conversion. II Materials survey [84W1].

Boron-rich solids: A chance for high-efficiency high-temperature energy conversion [95W].

References:

- 69S1 Sullenger, D.B., Phipps, H.D., Seabaugh, P.W., Hudgens, C.R., Sands, D.E., Cantrell, J.S.: Science 163 (1969) 93.
- 69S2 Sullenger, D.B., Phipps, H.D., Seabaugh, P.W., Hudgens, C.R., Sands, D.E., Cantrell, J.S.: Science 163 (1969) 931.
- 80G Golikova, O.A., Kazanin, M.M., Mirzazhonov, Z., Orlov, V.M., Tkalenko, E.N., Khomidov, T.:Sov. Phys. Semicond. 14 (1980) 49.
- 83B Berezin, A.A.: Phys. Lett. A 97 (1983) 105.
- 83R Rosolowski, J.H., Slack, G.A., Huseby, I.C.: in: Proc. 18th Intersoc.y Energy Convers. Eng. Conf., AIChE: Orlando, 1983, p. 2441.
- 84B Berezin, A.A.: J. Chem. Phys. 80 (1984) 1241.
- 84S Slack, G.A., Rosolowsky, J.H., Miller, M.Z.: in: 19th Intersoc. Energy Convers. Eng. Conf., San Francisco, 1984, p. 2244.
- 84W1 Wood, C.: Energy Convers. Manage. 24 (1984) 331.
- 84W2 Wood, C.: Energy Convers. Manage. 24 (1984) 317.
- 85L Lundström, T.: Pure Appl. Chem. 10 (1985) 1383.
- 86B Beckel, C.L., Vaughan, J.P.: 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. 305.
- 86R Ramamurthy, V., Satishkumar, M., Rajendraprasad, S.B.: Physica 138B (1986) 269.
- 86T Türkes, P.R.H., Swartz, E.T., Pohl, R.O.: 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. 346.
- 86W Werheit, H.: 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. 325.
- 87A Aselage, T.L.: 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. 267.
- 87E1 Emin, D.: in: Novel Refractory Semiconductors, MRS Symp. Proc. Vol. 97, D. Emin, T.L. Aselage, C. Wood ed., Materials Research Soc.: Pittsburgh, 1987, p. 3.
- 87E2 Emin, D.: Physics Today January (1987) 55.
- 87E3 Emin, D.: 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. 154.
- 87G1 Golikova, O.A.: Sov. Phys. Solid State 29 (1987) 1652.
- 87G2 Golikova, O.A.: Phys. Status Solidi (a) 101 (1987) 277.
- 87G3 Golikova, O.A., Klimashin, G.M., Kutasov, V.V., Tadzhiyev, A.: 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. 375.
- 87H1 Howard, I.A., Beckel, C.L., Emin, D.: Phys. Rev. B 35 (1987) 9265.
- 87H2 Howard, I.A., Beckel, C.L., Emin, D.: in: Novel Refractory Semiconductors, MRS Symp. Proc. Vol. 97, D. Emin, T.L. Aselage, C. Wood ed., Materials Research Soc.: Pittsburgh, 1987, p. 39.
- 87H3 Howard, I.A., Beckel, C.L., Emin, D.: Phys. Rev. B 35 (1987) 2929.
- 87K Ku, H.C., Klavins, P., Shelton, R.N.: Physica B & C 148 (1987) 117.
- 89G1 Golikova, O.A.: Usp. Fiz. NAUK 158 (1989) 581.
- 89G2 Golikova, O.A.: Sov. Phys. Usp. 32 (1989) 665.
- 90F Franz, R.: in: Thesis, University of Duisburg: Duisburg, 1990.
- 90H1 Hatakeyama, T., Kamimura, H.: in: 20th Int. Conference on the Physics of Semiconductors, Anastassakis, E.M.; Joannopoulos, ed., World Scientific: Singapore, 1990, p. 1767.
- 90H2 Higashi, I., Kobayashi, M., Takahashi, Y.: J. Cryst. Growth 99 (1990) 998.
- 90W Werheit, H.: in: The Physics and Chemistry of Carbides, Nitrides and Borides; NATO ASI Series E: Applied Sciences Vol. 185, R. Freer ed., Kluwer Academic Publishers: Dordrecht, 1990, p. 705.

- 91F Franz, R., Werheit, H.: 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 ed., American Institute of Physics: New York, 1991, p. 29.
- 91G Golikova, O.A., Kazanin, M.M., Klimashin, G.M., Kutasov, V.V.: 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. 289.
- 91S Schmirgeld, L., Zuppiroli, L., Brunel, M., Delafon, J., Templier, C.: 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. 630.
- 91W1 Wang, Bo-Cheng, Chiu, Ying-Nan: *Theochem* 77 (1991) 1.
- 91W2 Werheit, H.: in: Advances in Chemical Metallurgy, Proc. Int. Conf. at B.A.R.C., Bombay, India, January 9-11, 1991, C.K. Gupta and M.K. Totlani ed., B.A.R.C: Bombay, 1991, p. 57.
- 92G Golikova, O.A.: *Sov. Phys. Semicond.* 26 (1992) 900.
- 92S1 Shirai, K.: *J. Phys. Soc. Jpn.* 61 (1992) 2735.
- 92S2 Shirai, K., Gonda, S.: in: Proc. Int. Symp. Intelligent Design and Synthesis of Electronic Material Systems, Nov. 1992, Osaka, Japan (50th Anniversary of Osaka University), ed. Osaka University, 1992.
- 93E Emin, D.: *Phys. Rev. B* 48 (1993) 13691.
- 93H Hori, A., Kimura, K., Tada, T., Yamashita, H.: *J. Non-Cryst. Solids* 153&154 (1993) 308.
- 95K Kimura, K., Matsuda, H., Tamura, R., Fujimori, M., Schmechel, R., Werheit, H.: in: Proc. 5th Int. Conf. Quasicrystals, Avignon, France, 22 - 26 May 1995, C. Janot and R. Mosseri ed., World Scientific: Singapore, 1995, p. 730.
- 95W Werheit, H.: *Mater. Sci. Eng.* 29 (1995) 228, *High Temperature Electronics*, EMRS Symp. Proc. 50 (1994); *Mater. Sci. Eng. B* 29, K. Fricke and V. Krozer ed., North Holland: Amsterdam, 1995, p. 228.
- 96E Emin, D.: *Phys. Rev. B* 53 (1996) 1260.
- 96S1 Shirai, K.: *Transact. Mater. Res. Soc. Jpn.* 20 (1996) 478.
- 96S2 Shirai, K., Gonda, S.: *J. Phys. Chem. Solids* 57 (1996) 109.
- 96S3 Shirai, K., Gonda, S.: *Physica B* 219&220 (1996) 336.
- 96W1 Werheit, H., Schmechel, R., Kimura, K., Tamura, R., Lundström, T.: *Solid State Commun.* 97 (1996) 103.
- 96W2 Werheit, H., Schmechel, R., Tanaka, T., Ishizawa, Y., Lundström, T.: (presented at the 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996, to be published separately).
- 97K1 Kumashiro, Y., Yoshizawa, H., Tokoyama, T.: *J. Solid State Chem.* 133 (1997) 104 (Proc. 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996).
- 97K2 Kimura, K., Matsuda, H., Fujimori, M., Terauchi, M., Tanaka, M., Kumigashira, H., Yokoya, N., Takahashi, T.: in: Proc. 6th Int. Conf. Quasicrystals, Tokyo, Japan, 26 - 30 May, 1997, Takeuchi, S., Fujiwara, T. ed., World Scientific: Singapore 1998, p. 595.
- 97L Lee, S.P., Kim, C.K., Nahm, K., Mittag, M., Jeong, Y.H., Ryu, C.M.: *J. Appl. Phys.* 81 (1997) 2454.
- 97S1 Shirai, K.: *J. Solid State Chem.* 133 (1997) 322 (Proc. 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996).
- 97S2 Shirai, K.: *J. Solid State Chem.* 133 (1997) 215 (Proc. 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996).
- 97S3 Shirai, K.: (presented at the 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996).
- 97S4 Shirai, K.: *J. Solid State Chem.* 133 (1997) 327 (Proc. 12th Int. Symp. Boron, Borides and Rel. Compounds, Baden, Austria, 1996).
- 98E Emin, D.G., Evans, S.S., McCready, S.S.: *Phys. Status Solidi (b)* 205 (1998) 311.
- 98H Hubert, H., Garvie, L.A.J., Devouard, B., McMillan, P.F.: *High Press. Mater. Res.* 499 (1998) 315 (*Mater. Res. Soc. Symp.*).
- 98M McMillan, P.F., Hubert, H., Chizneshya, A.V.G.: *High Press. Mater. Res.* 499 (1998) 453 (*Mater. Res. Soc. Symp.*).
- 99H Hillebrecht, H., Neyer, F.D.: *J. Solid State Chem.* (2000) (Proc. 13th Int. Symp. Boron, Borides and Rel. Compounds, Dinard, France, Sept. 1999).
- 99K Kimura, K., Fujimori, M., Kirihaara, K., Nakata, T., Takata, M., Nakayama, T., Kubota, Y., Nishibori, E., Sakata, M.: *J. Solid State Chem.* (2000) (Proc. 13th Int. Symp. Boron, Borides and Rel. Compounds, Dinard, France, Sept. 1999).
- 99O Oku, T., Higashi, I.: *J. Solid State Chem.* (2000) (Proc. 13th Int. Symp. Boron, Borides and Rel. Compounds, Dinard, France, Sept. 1999).

- 99S Shirai, K., Katayama-Yoshida, H.: J. Solid State Chem. (2000) (Proc. 13th Int. Symp. Boron, Borides and Rel. Compounds, Dinard, France, Sept. 1999).
- 99W Werheit, H.: in: Electric Refractory Materials, Y. Kumashiro ed., Marcel Dekker: New York, 1999 (in press).