Kirk-Othmer Encyclopedia of Chemical Technology.

FLUORINE COMPOUNDS, INORGANIC, BARIUM

1. Barium Fluoride

Barium fluoride[7782-32-8], BaF_2, is a white crystal or powder. Under the microscope crystals may be clear and colorless. Reported melting points vary from 1290 (1) to 1355°C (2), including values of 1301 (3) and 1353°C (4). Differences may result from impurities, reaction with containers, or inaccurate temperature measurements. The heat of fusion is 28 kJ/mol (6.8 kcal/mol) (5), the boiling point 2260°C (6), and the density 4.9 g/cm^3. The solubility in water is about 1.6 g/L at 25°C and 5.6 g/100 g (7) in anhydrous hydrogen fluoride. Several preparations for barium fluoride have been reported (8–10).

High purity BaF_2 can be prepared from the reaction of barium acetate and aqueous HF (11), by dissolving the impure material in 2-12*N* HCl and recrystallizing at $-40^\circ C$ (12), by vacuum distillation of the metal fluoride impurities from a BaF_2 melt (13), by purification of the aqueous acetate solution by ion exchange followed by fluorination (14), by solvent extraction using dithiocarbamate and CCl_4 (15–17), and by solvent extraction using acetonitrile (18).

A typical analysis of the commercial product is 99% with a loss on ignition of 0.9%; sulfates as SO_4, 0.2%; hexafluorosilicate as SiF_4, 0.02%; heavy metals as lead, 0.02%; and iron, 0.005%.

Barium fluoride is used commercially in combination with other fluorides for arc welding (qv) electrode fluxes. However, this usage is limited because of the availability of the much less expensive naturally occurring calcium fluoride.

Other reported uses of barium fluoride include the manufacture of fluorophosphate glass (19); stable fluoride glass (20); fluoroaluminate glass (21); fluorozirconate glass (22); infrared transmitting glass (23); in oxidation-resistant ceramic coatings (24); in the manufacture of electric resistors (25, 26); as a superconductor with copper oxide (27); and as a fluoride optical fiber (28) (see Fiber optics; Glass).

The toxicity of barium fluoride has received only little attention. A value for oral LD_{LO} of 350 mg/kg in guinea pigs has been reported (29). OSHA has a TWA standard on the basis of Ba of 0.5 mg/m^3 for barium fluoride (29) in addition to a standard TWA on the basis of *F* of 2.5 mg/m^3 (30). NIOSH has issued a criteria document (30) on occupational exposure to inorganic fluorides.

BIBLIOGRAPHY

"Barium Fluoride" under "Fluorine Compounds, Inorganic," in *ECT* 1st ed., Vol. 6, p. 677, by F. D. Loomis, Pennsylvania Salt Manufacturing Co.; in *ECT* 2nd ed., Vol. 9, p. 551, by W. E. White, Ozark-Mahoning Co.; "Barium" under "Fluorine Compounds, Inorganic," in *ECT* 3rd ed., Vol. 10, p. 684, by C. B. Lindahl, Ozark-Mahoning Co.

Cited Publications

1. I. Barin and O. Knache, *Thermochemical Properties of Inorganic Substances*, Springer Verlag, Berlin, 1973.
2. H. Kojima, S. G. Whiteway, and C. R. Masson, *Can. J. Chem.* **46**, 2698 (1968).
3. I. Jackson, *Phys. Earth Planet. Inter.* **14**, 143 (1977).
4. B. Porter and E. A. Brown, *J. Am. Ceram. Soc.* **45**, 49 (1962).
5. G. Petit and A. Cremieo, *C. R. Acad. Sci.* **243**, 360 (1956).
6. O. Ruff and L. LeBoucher, *Z. Anorg. Chem.* **219**, 376 (1934).
7. A. W. Jache and G. H. Cady, *J. Phys. Chem.* **56**, 1106 (1952).
8. SU 1325018 Al (July 23, 1985), V. A. Bogomolov and co-workers.
9. SU 998352 A1 (Feb. 23, 1983), A. A. Luginina and co-workers.
10. *Zh. Neorg. Khim 1981*, **26**(2), 332–336.
11. Jpn. Pat. 90-144378 (June 4, 1990), K. Kobayashi, K. Fujiura, and S. Takahashi.
12. EP 90-312689 (Nov. 21, 1990), J. A. Sommers, R. Ginther, and K. Ewing.
13. A. M. Garbar, A. N. Gulyaikin, G. L. Murskii, I. V. Filimonov, and M. F. Churbanov, *Vysokochist, Veshchestva* (6), 84–85 (1990).
14. A. M. Garbar, A. V. Loginov, G. L. Murskii, V. I. Rodchenkov, and V. G. Pimenov, *Vysokochist, Veshchestva* (3), 212–213 (1989).
15. Jpn. Pat. 01028203 A2 (Jan. 30, 1989), K. Kobayashi (to Heisei).
16. K. Kobayashi, *Mater. Sci. Forum*, **32–33**(5), 75–80 (1988).
17. DE 3813454 A1 (Nov. 3, 1988); Jpn. Pat. 87-100025 (Apr. 24, 1987), H. Yamashita and H. Kawamoto.
18. J. Guery and C. Jacoboni, in Ref. 16, 31–35.
19. V. D. Khalilev, V. G. Cheichovskii, M. A. Amanikov, and Kh. V. Sabirov, *Fiz. Khim. Stekla* **17**(5), 740–743 (1991).
20. Y. Wang, *J. Non. Cryst. Solids* **142**(1–2), 185–188 (1992).
21. H. Hu, F. Lin, and J. Feng, *Guisudnyan Xuebao* **18**(6), 501–505 (1990).
22. M. N. Brekhovskikh, V. A. Fedorov, V. S. Shiryaev, and M. F. Churbanov, *Vysokochist Veshchestva* (1), 219–223 (1991).
23. A. Jha and J. M. Parker, *Phys. Chem. Glasses* **32**(1), 1–12 (1991).
24. EP 392822 A2 17 (Oct. 17, 1990), L. M. Niebylski.
25. Jpn. Pat. 63215556 A2 (Sept. 8, 1988), T. Honda, T. Yamada, K. Onigata, and S. Tosaka (to Showa).
26. Jpn. Pat. 63215553 A (Sept. 28, 1988), T. Honda, T. Yamada, K. Onigata, and S. Tosaka (to Showa).
27. S. R. Ovshinsky, R. T. Young, B. S. Chao, G. Fournier, and D. A. Pawlik, *Rev. Solid State Sci.* **1**(2), 207–219 (1987).
28. J. Chen and co-workers, *J. Non-Cryst. Solids* **140**(1–3), 293–296 (1992).
29. *Registry of Toxic Effects of Chemical Substances*, Vol. **II**, NIOSH, Washington, D.C., 1977, p. 141.
30. *Criteria for a Recommended Standard-Occupational Exposure to Inorganic Fluorides*, PB 246 692, NIOSH 76-103, U.S. Department of Health, Education, and Welfare, Washington, D.C., 1975.

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