

- ¹ M. Freemantle, *An Introduction to Ionic Liquids*, RSC Publishing: Cambridge, 2009.
- ² J. D. Holbrey and R. D. Rogers, "Physicochemical Properties of Ionic Liquids: Melting Points and Phase Diagrams," in *Ionic Liquids in Synthesis*, 2nd ed., P. Wasserscheid and T. Welton, Eds, Wiley-VCH Verlag: Weinheim, 2008, pp. 57–72; see "Background Reading".
- ³ The crystal structure has been summarized, but these details were not included: J. Fuller, R. T. Carlin, H. C. De Long, and D. Haworth, *Chem. Commun.* 299 (1994).
- ⁴ The lattice energy of the closely related 1-butyl-3-methylimidazolium hexafluorophosphate has been computed as -457 kJ mol^{-1} : I. Krossing, J. M. Slattery, C. Daguene, P. J. Dyson, A. Oleinikova, and H. Weingärtner, *J. Am. Chem. Soc.* 128, 13427–34 (2006); I. Krossing, J. M. Slattery, C. Daguene, P. J. Dyson, A. Oleinikova, and H. Weingärtner, *J. Am. Chem. Soc.* 129, 11296 (2007).
- ⁵ J. D. Holbrey, A. E. Visser, and R. D. Rogers, "Solubility and Solvation in Ionic Liquids," in *Ionic Liquids in Synthesis*, 2nd ed., P. Wasserscheid and T. Welton, Eds., Wiley-VCH Verlag: Weinheim, 2008, pp. 89–102; see "Background Reading".
- ⁶ G. Wulfsberg, *Inorganic Chemistry*, University Science Books: Sausalito, CA, 2000, Table 13.1, p. 663.
- ⁷ Isolated at 4K in low-temperature noble-gas matrices: Y. Gong, M. Zhou, M. Kaupp, and S. Riedel, *Angew. Chem., Intl. Ed.* 48, 7879 (2009).
- ⁸ J. M. Léger, J. Haines, M. Schmidt, J. P. Petitet, A. S. Pereira, and J. A. H. da Jornada, *Nature*, 383, 401 (1996).
- ⁹ C. S. Yoo, H. Cynn, F. Gygi, G. Galli, V. Iota, M. Nicol, S. Carlson, D. Häusermann, and C. Mailhot, *Phys. Rev. Lett.* 83, 5527 (1999).
- ¹⁰ R. B. Seymour and G. B. Kauffman, *J. Chem. Educ.* 67, 763 (1990).
- ¹¹ This topic is reviewed in *d*-block metal oxides: A. Muñoz-Páez, *J. Chem. Educ.* 71, 381 (1994), see "Background Reading."
- ¹² M. Greenblatt, "Ionic Conductors," in *Encyclopedia of Inorganic Chemistry*, 2nd ed., R. B. King, Ed., John Wiley & Sons: Chichester, 2005, vol. 4, pp. 2094–2127.
- ¹³ L. Sebastian and J. Gopalakrishnan, *J. Mater. Chem.* 13, 433 (2003).
- ¹⁴ H. J. Orman and P. J. Wiseman, *Acta Crystallogr., Sec. C: Cryst. Struct. Commun.* 40, 12 (1984).

- ¹⁵ J. L. Kirschvink, A. Kobayashi-Kirschvink, and B. J. Woodford, *Proc. Natl. Acad. Sci. USA* 89, 7683 (1992).
- ¹⁶ M. Verdaguer and G. S. Girolami, "Magnetic Prussian Blue Analogues," in *Magnetism: Molecules to Materials V*, J. S. Miller and M. Drillon, Eds., Wiley-VCH Verlag: Weinheim, 2005, p.283.
- ¹⁷ O. Sato, T. Iyoda, A. Fujishima, and K. Hashimoto, *Science* 271, 49 (1996).
- ¹⁸ S. Ferlay, T. Mallah, R. Ouahès, P. Veillet, and M. Verdaguer, *Nature* 378, 701 (1995).
- ¹⁹ A. Müller and J. G. Bednorz, *Science* 217, 1133 (1987).
- ²⁰ Y. Kamihara, T. Watanabe, M. Hirano, and H. Hosono, *J Amer. Chem. Soc.* 130, 3296 (2008).
- ²¹ G. P. Collins, *Sci. Amer.* 301(2), 62 (2009).
- ²² H. Takahashi, K. Igawa, K. Arii, Y. Kamihara, M. Hirano, and H. Hosono, *Nature* 453, 376 (2008).
- ²³ A. P. Drozdov, M. I. Erements, I. A. Troyan, V. Ksenofontov, and S. I Shylin, *Nature* 525, 73 (2015).
- ²⁴ S. Tanaka, *Jap. Jnl. Appl. Phys.* 45, 9011 (2006).
- ²⁵ T. Masuda, H. Yumura, and M. Watanabe, *Physica C* 468, 2014 (2008).
- ²⁶ G. Wulfsberg, *Inorganic Chemistry*, University Science Books: Sausalito, CA, 2000, p. 678.
- ²⁷ J. E. Cohen and D. Tilman, *Science* 274, 1150 (1996).
- ²⁸ H. Fountain, *New York Times* Mar. 31, 2009, p. D1.
- ²⁹ *Kirk-Othmer Encyclopedia of Chemical Technology*, 5th ed, Wiley: New York, 2001.
- ³⁰ S. E. Manahan, *Environmental Chemistry*, 8th ed, Lewis Publishers: Boca Raton, FL, 2000.
- ³¹ P. G. Brewer, G. Friederich, E. T. Peltzer, and F. M. Orr Jr., *Science* 284, 943 (1999).
- ³² F. Inagaki et al., *PNAS*, 103, 14164 (2006).
- ³³ A. Khaleel, P. N. Kapoor, and K. J. Klabunde, *Nano Struct. Mater.* 11, 459 (1999).
- ³⁴ C. S. Henshilwood, F. d'Errico, K. L. van Niekirk, Y. Coquinot, Z. Jacobs, S.-E. Lauritzen, M. Menu, and R. García-Moreno, *Science* 334, 219 (2011).
- ³⁵ H. Berke, *Chem. Soc. Rev.* 36, 15 (2007).
- ³⁶ J. Yu and R. Xu, *Chem. Soc. Rev.* 35, 593 (2006).
- ³⁷ J. Bell, *Sci. Amer.* 295(6), 62 (2006), see "Background Reading"; P. R. Christensen, *Sci. Amer.* 293(1), 32 (2005), see "Background Reading".
- ³⁸ K. Chang, *New York Times* Dec. 9, 2014, p. D1.

- ³⁹ F. J. Martín-Torres et al. *Nature Geoscience* 8, 357 (2015).
- ⁴⁰ E. Wilson, *Chem. Eng. News* Aug. 11, 2008, p. 13.
- ⁴¹ E. Wilson, *Chem. Eng. News* Oct. 5, 2015, p. 5.
- ⁴² Y. Ye et al, *Am. Mineral.* 97, 573 (2012); B. Schmandt, S. D. Jacobsen, T. W. Becker, Z. Liu, and K. G. Ducker, *Science* 344, 1265 (2014).
- ⁴³ K. Ohta, S. Onoda, K. Hirose, R. Sinmyo, K. Shimizu, N. Sata, Y. Ohishi, A. Yasuhara, *Science* 320, 89 (2008).
- ⁴⁴ K. Hirose, *Sci. Amer.* 302(6), 76 (2010), see “Background Reading”.
- ⁴⁵ R. Jeanloz and T. Lay, *Sci. Amer.* 268(5), 48 (1993).
- ⁴⁶ H. W. Green II, *PNAS* 104, 9133 (2007); H. W. Green, II, *Sci. Amer.* 271(3), 64 (1994).
- ⁴⁷ J. W. Valley et al. *Nature Geoscience* 7, 219 (2014); E. A. Bell, P. Boehnke, T. M. Harrison, and W. L. Mao, *PNAS* 112, 14518 (2015); J. Lavallo, *Chem. Eng. News* Dec. 7, 2015, p. 40.
- ⁴⁸ J. W. Valley, *Sci. Amer.* 293(4), 58 (2005), see “Background Reading”.
- ⁴⁹ C. Zimmer, *Sci. Amer.* 310(3), 59 (2014), see “Background Reading”.
- ⁵⁰ M. D. Nikalje, P. Puhukan, and A. Sudalai, *Org. Prep. Proced.* 32, 1 (2000).
- ⁵¹ C. D. Williams, in R. B. King, Ed., *Encyclopedia of Inorganic Chemistry*, 2nd ed., John Wiley & Sons, Ltd.: Chichester, UK, 2005, vol. 9, pp. 5831.
- ⁵² W. M. Meier, D. H. Olson, and Ch. Baerlocher, “Atlas of Zeolite Structure Types,” *Zeolites*, 17, 1 (1996); C. C. Freyhardt, M. Tsapatsis, R. F. Lobo, K. J. Balkus Jr., and M. E. Davis, *Nature*, 381, 295 (1996).
- ⁵³ See, for example, F. Blatter and E. Schumaker, *J. Chem. Educ.* 67, 519 (1990); K. J. Balkus, Jr., and K. T. Ly, *J. Chem. Educ.* 68, 875 (1991).
- ⁵⁴ W. Shibata and K. Seff, *J. Phys. Chem. B* 101, 9022 (1997).
- ⁵⁵ V. Petkov, S. J. L. Billinge, T. Vogt, A. S. Ichimura, and J. L. Dye, *Phys. Rev. Lett.* 89, 075502-1 (2002).