Introduction

1 General remarks

Up to June 2006, 167 zeolite framework types have been approved by the Structure Commsission of the International Zeolite Association (IZA), 109 of which are now covered in this series. Since volume C [2002Bau1] went to press, we have added about 700 structures to our data base now containing 4,200 entries of zeolite-type structures (that is much more than one can get from the most extensive database for inorganic crystal structures [2005ICS1] which produces 1502 hits for the keyword “zeolites” in the Mineral/Group search option). The chapters on codes ASV, BCT, BEC, CDO, EON, ETR, GIU, IHW, ITH, ITW, IWR, IWW, and LIT will be published together with additional entries for previously covered codes at the end of the last volume of this series.

In this volume D, 1140 crystal structure determinations, refinements, and descriptions are listed, dominated by the large numbers of LTA-type structures (375 entries) representing one of the most important ion exchange materials especially in detergents (LTA.6.1), followed by NAT-type structures (236) and RHO-type structures (160). The natrolite minerals (NAT) and RHO-type zeolites are interesting materials for crystal chemical studies because of their extremely flexible framework structures. Zeolite rho is an important catalyst for the selective synthesis of dimethylamines (RHO.6). Even more interesting are the MFI-type zeolites listed with 116 entries which are used in petrochemical processes (see MFI.6).

The standardization of atomic coordinates according to a systematic-subgroup relation is one of the special goals of this work described in chapter 3 of volume B. Details on the standardization process are published in [2004Fis1] and its benefits for crystal chemical comparisons are demonstrated in [2004Bau1].

Errors found by us in volumes A, B, and C or communicated to us before this volume went to press are listed under Errata at the end of this volume. Updates to all codes, especially new symmetry derivations, chemical data, and structural parameters will be given in or after the last volume of this series.

As described in chapter 1 of volume B, all crystal structure entries have been checked for their internal and external consistency. Misprints in the original literature were corrected, partly after correspondence with the authors, and partly to the best of our knowledge, especially if typographical errors were obvious or in all those cases where the authors either did not respond to our inquiries or could not resolve the problem.

2 Systematics, descriptions, and definitions

2.1 Modifications and changes

2.1.1 Bärnighausen tree

Starting in this volume D we have assigned the letter *i* to *klassengleich* subgroup relationships with identical space groups in the Bärnighausen trees (see, e.g., NAT p. 273). The derivations of the symmetry relationships were greatly facilitated making use of [2004Won1].

2.1.2 Chemical composition

Chemical compositions are still given in the format described in chapter 10.2 of volume B [2000Bau1] with cations on the left and neutral species and anions right on the right of the framework compositions separated by periods. However, it should be noted that we do not distinguish between cationic and neutral molecules in the sorbate/template column of Tables FTC.2.1 (FTC = framework type code). Ammonium (NH_4^+) is never listed as a sorbate because it is too small and similar to K^+. Larger molecules like its methylamine derivatives are listed though.

2.1.3 Crystal structure drawings

Starting with this volume D we use a new version of the STRUPLO program (latest release from [2006Fis1] for the crystal structure drawings. It is now capable of drawing solid isometric cages.

2.2 Minerals with zeolite-type frameworks

Mineral names in Tables FTC.1.1 are given in square brackets when the minerals were modified by dehydration, calcination, or cation exchange. The mineral name refers to the original species even though its chemical composition might be changed by cation exchange, thermal or acid treatment. The names are given in parentheses if it is a synthetic analogue to the mineral species. Table 2.2.1 lists all entries of Table 2.3.1 of volume B and Table 2.2.1 of volume C together with the new entries of this volume.

Table 2.2.1 Selected entries of minerals with framework type codes ABW to RHO).

mineral name	chemical composition	space group	FD	entry code
afghanite	$Na_{18}Ca_{10}K_{0.8} \cdot Al_{24}Si_{24}O_{96} \cdot 10.4H_2O$ $0.8CO_3$ $5.6Cl$ $5.6SO_4$	$P\,6_3\,m\,c$	15.9	AFG1991a01
	$Na_{18}Ca_{10}K_4 \cdot Al_{24}Si_{24}O_{96} \cdot 6SO_4 6Cl$	$P\,3\,1\,c$	15.8	AFG1997a01
amicite	$K_4Na_4 \cdot Al_8Si_8O_{32} \cdot 10H_2O$	$I\,1\,1\,2$	15.2	GIS1979a01
ammonioleucite	$(NH_4)_{14} \cdot Al_{14}Si_{34}O_{96}$	$I\,4_1/a$	20.0	ANA1998e01
analcime	$Na_{16} \cdot Al_{16}Si_{32}O_{96} \cdot 16H_2O$	$I\,a\,\bar{3}\,d$	18.5	ANA1972a01
	$Na_{16} \cdot Al_{16}Si_{32}O_{96} \cdot 16H_2O$	$I\,4_1/a\,c\,d$	18.6	ANA1978a05
	$Na_{16} \cdot Al_{16}Si_{32}O_{96} \cdot 16H_2O$	$I\,b\,c\,a$	18.6	ANA1978a04
bellbergite	$(Ca,Na)_4Ca_2Sr_2(K,Ba)_2 \cdot Al_{18}Si_{18}O_{72}$ $\cdot 30H_2O$	$P\,6_3/m\,m\,c$	14.8	EAB1993a01
bikitaite	$Li_2 \cdot Al_2Si_4O_{12} \cdot 2H_2O$	$P\,1\,2_1\,1$	20.3	BIK1974a01

Table 2.2.1 (continued)

mineral name	chemical composition	space group	FD	entry code
	$Li_2 \cdot Al_2Si_4O_{12} \cdot 2H_2O$	$P\,1$	20.3	BIK1986a01
boggsite	$Ca_{7.8}Na_{2.9}Al_{18.5}Si_{77.5}O_{192} \cdot 70H_2O$	$I\,m\,m\,a$	15.6	BOG1990a01
brewsterite	$Sr_{1.5}Ba_{0.5} \cdot Al_4Si_{12}O_{32} \cdot 10H_2O$	$P\,2_1/m$	17.3	BRE1977a01
	$SrBa \cdot Al_4Si_{12}O_{32} \cdot 10H_2O$	$P\,\bar{1}$	17.4	BRE1996a02
bystrite	$Na_{10}K_4Ca_2 \cdot Al_{11.7}Si_{12.3}O_{48} \cdot 2.8S_3\ 2H_2O\ 2CO_3$	$P\,3\,1\,c$	15.7	LOS1991a01
cancrinite	$Na_6 \cdot Al_6Si_6O_{24} \cdot 1.5Ca\ 1.6CO_3\ 2H_2O$	$P\,6_3$	17.1	CAN1982b01
	$Na_7 \cdot Al_5Si_7O_{24} \cdot CO_3\ 3H_2O$	$P\,6_3\,m\,c$	17.2	CAN1991d01
chabazite-Ca	$Ca_{1.95} \cdot Al_{3.9}Si_{8.1}O_{24} \cdot 13H_2O$	$R\,\bar{3}\,m$	14.5	CHA1963a01
	$Ca_{1.4}K_{0.2}Mg_{0.4}Sr_{0.3} \cdot Al_{3.9}Si_{8.2}O_{24} \cdot 12.2\ H_2O$	$R\,\bar{3}\,m$	14.4	CHA1982b01
	$Ca_{1.4}Sr_{0.3} \cdot Al_{3.8}Si_{8.3}O_{24} \cdot 13H_2O$	$R\,\bar{3}\,m$	14.5	CHA1982c01
	$Ca_{1.4}K_{0.2}Na_{0.3} \cdot Al_{3.4}Si_{8.6}O_{24} \cdot 13H_2O$	$R\,\bar{3}\,m$	14.6	CHA1983b01
	$Ca_{0.8}Fe_{0.6} \cdot Al_3Si_9O_{24} \cdot 10H_2O$	$R\,\bar{3}\,m$	14.5	CHA1985c02
	$Ca_{1.4}K_{0.2}Na_{0.3} \cdot Al_{3.4}Si_{8.6}O_{24} \cdot 13H_2O$	$P\,\bar{1}$	14.6	CHA1983b02
chabazite-Li	$Ca_{0.2}Li_{3.3} \cdot Al_{3.7}Si_{8.3}O_{24} \cdot 12H_2O$	$R\,\bar{3}\,m$	14.7	CHA1994c01
chiavennite	$Ca_4Mn_4H_8 \cdot Be_8Si_{20}O_{60} \cdot 8H_2O$	$P\,n\,a\,b$	20.9	CHI1995a01
clinoptilolite-Ca	$Ca_{1.9}K_{1.1}Na_{1.8} \cdot Al_{6.7}Si_{29.2}O_{72} \cdot 24H_2O$	$C\,2/m$	17.1	HEU1977a01
clinoptilolite-K	$Ca_{1.1}K_{2.4}Mg_{0.3}Na_{1.2} \cdot Al_{6.6}Si_{29.5}O_{72} \cdot 18H_2O$	$C\,2/m$	19.0	HEU1999c02
clinoptilolite-Na	$Ca_{1.3}K_{1.0}Na_{3.2} \cdot Al_{7.4}Si_{28.4}O_{72} \cdot 22H_2O$	$C\,2/m$	17.1	HEU1975a02
dachiardite	$(Na,K,Ca_{0.5})_5Al_5Si_{19}O_{48} \cdot 13H_2O$	$C\,2/m$	17.5	DAC1990a01
davyne	$Na_4K_2Ca_2 \cdot Al_6Si_6O_{24} \cdot 2Cl\ SO_4$	$P\,6_3/m$	16.0	CAN1990a01
	$Na_6Ca_2 \cdot Al_6Si_6O_{24} \cdot 2Cl\ 2OH$	$P\,6_3$	15.7	CAN1990b01
edingtonite	$Ba_2 \cdot Al_4Si_6O_{20} \cdot 7H_2O$	$P\,\bar{4}\,2_1\,m$	16.7	EDI1984a01
	$Ba_2 \cdot Al_4Si_6O_{20} \cdot 8H_2O$	$P\,2_1\,2_1\,2$	16.6	EDI1976a01
epistilbite	$Ca_3Na \cdot Al_6Si_{18}O_{48} \cdot 16H_2O$	$C\,1\,2/m\,1$	17.6	EPI1967a01
	$Ca_{2.6}Na_{0.8} \cdot Al_6Si_{18}O_{48} \cdot 16H_2O$	$C\,1\,2\,1$	17.7	EPI1985a02
	$Ca_{2.7}Na_{0.3} \cdot Al_6Si_{18}O_{48} \cdot 16H_2O$	$C\,1$	17.7	EPI1996a01
erionite-Ca	$Ca_{4.3}K_{2.2}Na_{0.2} \cdot Al_{11}Si_{25}O_{72} \cdot 36H_2O$	$P\,6_3/m\,m\,c$	15.5	ERI1998a02
erionite-K	$Ca_{1.3}K_{2.0}Mg_{0.6}Na_{1.9} \cdot Al_9Si_{26}O_{72} \cdot 10H_2O$	$P\,6_3/m\,m\,c$	15.6	ERI1973a01
erionite-Mg, K	$Ca_{0.7}K_{2.1}Mg_{2.4}Na_{1.3} \cdot Al_{13.1}Si_{23.6}O_{72} \cdot 27.4H_2O$	$P\,6_3/m\,m\,c$	16.0	ERI1967a01
faujasite-Na	$Ca_{14}Na_{29} \cdot Al_{58}Si_{134}O_{384} \cdot 263H_2O$	$F\,d\,\bar{3}\,m$	12.7	FAU1964a01
ferrierite-Mg	$Na_{1.3}K_{0.2}Mg_2 \cdot Al_{5.5}Si_{30.5}O_{72} \cdot 18H_2O$	$I\,m\,m\,m$	17.8	FER1966a01
ferrierite-Na	$Na_3KMg_{0.5} \cdot Al_5Si_{31}O_{72} \cdot 18H_2O$	$P\,1\,2_1/n\,1$	18.0	FER1985a01
franzinite	$(Na,K)_{30}Ca_{10} \cdot Si_{30}Al_{30}O_{120} \cdot 10SO_4\ 2H_2O$	$P\,\bar{3}\,m\,1$	15.6	FRA2000a01
garronite	$Ca_3 \cdot Al_6Si_{10}O_{32} \cdot 14H_2O$	$I\,\bar{4}\,m\,2$	15.8	GIS1992a01
	$Ca_3 \cdot Al_6Si_{10}O_{32} \cdot 14H_2O$	$I\,1\,1\,2/b$	16.0	GIS1999c01
gismondine	$Ca_4 \cdot Al_8Si_8O_{32} \cdot 16H_2O$	$P\,1\,1\,2_1/a$	15.3	GIS1963a01
	$Ca_8 \cdot Al_{16}Si_{16}O_{64} \cdot 16H_2O$	$P\,2_1\,2_1\,2_1$	18.6	GIS1993a02
gmelinite-Na	$Na_8 \cdot Al_8Si_{16}O_{48} \cdot 22H_2O$	$P\,6_3/m\,m\,c$	14.6	GME1982a01
gmelinite-Ca	$Ca_{2.06}K_{0.11}Na_{0.78}Sr_{1.35} \cdot Al_{7.82}Si_{16.21}O_{48} \cdot 23.23H_2O$	$P\,6_3/m\,m\,c$	14.6	GME1982a02
gmelinite-K	$K_3Ca_2 \cdot Al_8Si_{16}O_{48} \cdot 24H_2O$	$P\,6_3/m\,m\,c$	14.6	GME1990a01
gobbinsite	$Ca_{0.6}Na_{4.3} \cdot Al_{5.6}Si_{10.4}O_{32} \cdot 12H_2O$	$P\,n\,m\,2_1$	15.9	GIS1994a01
	$Ca_{0.6}K_{2.2}Na_{2.6} \cdot Al_6Si_{10}O_{32} \cdot 12H_2O$	$P\,n\,m\,2_1$	15.9	GIS1985b01
gonnardite	$Na_{4.51}Ca_{1.84} \cdot Al_{8.59}Si_{11.50}O_{40} \cdot 12.61H_2O$	$I\,\bar{4}\,2\,d$	17.2	NAT1999b01

Table 2.2.1 (continued)

mineral name	chemical composition	space group	FD	entry code
goosecreekite	$Ca \cdot Al_2Si_6O_{16} \cdot 5H_2O$	$P\,1\,1\,2_1$	17.6	GOO1986a01
gottardiite	$Ca_{4.8}K_{0.2}Mg_{3.1}Na_{2.5} \cdot Al_{18.8}Si1_{17.2}O_{272} \cdot 93H_2O$	$C\,c\,m\,e$	17.4	NES1996a01
harmotome	$Ca_{0.5}Ba_2 \cdot Al_5Si_{11}O_{32} \cdot 12H_2O$	$P\,1\,2_1/m\,1$	16.0	PHI1974a02
heulandite-Ca	$Ca_{3.7}Na_{1.30} \cdot Al_{8.9}Si_{27.1}O_{72} \cdot 21H_2O$	$C2/m$	17.2	HEU1994a01
	$Ca_{3.6}K_{0.4}Na_{1.3} \cdot Al_{9.4}Si_{26.7}O_{72} \cdot 26H_2O$	Cm	17.1	HEU1972a02
hsianghualite	$Ca_{24}Li_{16} \cdot Be_{24}Si_{24}O_{96} \cdot 16F$	$I\,2_1\,3$	22.5	ANA1991c01
kalborsite	$K_6 \cdot Al_4Si_6O_{20} \cdot B(OH)_4\,Cl$	$P\,\bar{4}\,2_1\,c$	15.8	EDI1980a01
laumontite	$Ca_4 \cdot Al_8Si_{16}O_{48} \cdot 17.2H_2O$	$C\,1\,2/m\,1$	17.6	LAU1992a01
H_2O-poor laumontite	$Ca_4 \cdot Al_8Si_{16}O_{48} \cdot 12H_2O$	$C\,1\,2/m\,1$	17.6	LAU1970a01
Na,K-rich laumontite	$Ca_2K_2Na_2 \cdot Al_8Si_{16}O_{48} \cdot 14H_2O$	$C\,1\,2/m\,1$	17.8	LAU2000a01
Na,K-rich laumontite	$Ca_{2.6}K_{1.6}Na_{1.2} \cdot Al_8Si_{16}O_{48} \cdot 14H_2O$	$P\,1\,2/a\,1$	17.8	LAU1997a01
leucite	$K_{16} \cdot Al_{16}Si_{32}O_{96}$	$I\,4_1/a$	20.4	ANA1976a01
	$K_{16} \cdot Al_{16}Si_{32}O_{96}$	$I\,a\,\bar{3}\,d$	19.4	ANA1993b05
	$K_{16} \cdot Al_{16}Si_{32}O_{96}$	$I\,4_1/a\,c\,d$	19.4	ANA1990b12
levyne-Ca	$Ca_8Na_2K \cdot Al_{19}Si_{35}O_{108} \cdot 50H_2O$	$R\,\bar{3}\,m$	15.2	LEV1975a01
levyne-Na	$Ca_{3.2}KNa_{10.7} \cdot Al_{18.8}Si_{35.3}O_{108} \cdot 44.2H_2O$	$R\,\bar{3}\,m$	15.4	LEV1996a01
liottite	$Ca_{11}Na_9K_4 \cdot Al_{18}Si_{18}O_{72} \cdot 2H_2O\ 4SO_4\ 2CO_3\ 3Cl\ 4OH$	$P\,\bar{6}\,m\,2$	15.6	LIO1977a01
	$Ca_9Na_{10}K_5 \cdot Al_{18}Si_{18}O_{72} \cdot 5SO_4\ 3.5Cl\ 0.5F$	$P\,\bar{6}$	15.6	LIO1996a01
lithosite	$K_{12}H_4 \cdot Al_8Si_{16}O_{52}$	$P\,1\,2_1\,1$	18.3	LIT1986a01
lovdarite	$K_4Na_{12} \cdot Be_8Si_{28}O_{72} \cdot 18H_2O$	$P\,c\,2\,m$	18.3	LOV1990a01
maricopaite	$Ca_{2.2}Pb_{7.2} \cdot Al_{11.6}Si_{36.4}O_{99.6} \cdot 31.8H_2O$	$C\,m\,2\,m$	16.6	MOR1994b01
marinellite	$Na_{32}K_{11}Ca_6 \cdot Al_{36}Si_{36}O_{144} \cdot 8SO_4\ 1.6Cl\ 3.4H_2O$	$P\,3\,1\,c$	15.8	MAR2003a01
mazzite-Mg	$Ca_{1.4}K_{2.5}Mg_{2.1}Na_{0.3} \cdot Al_{9.9}Si_{26.5}O_{72} \cdot 28H_2O$	$P\,6_3/m\,m\,c$	16.1	MAZ1975a01
mazzite-Na	$Na_8 \cdot Al_8Si_{28}O_{72} \cdot 30H_2O$	$P\,6_3/m\,m\,c$	16.1	MAZ2005a01
melanophlogite	$Si_{184}O_{368} \cdot 7.2CH_4\ 4.08CO_2\ 14.16N_2$	$P\,4_2/n\,b\,c$	19.1	MEP2001a01
	$Si_{46}O_{92} \cdot 1.8CH_4\ 1.02CO_2\ 3.54N_2$	$P\,m\,\bar{3}\,n$	19.0	MEP1983a01
merlinoite	$K_5Ca_2 \cdot Al_9Si_{23}O_{64} \cdot 24H_2O$	$I\,m\,m\,m$	16.0	MER1979a01
mesolite	$Na_{15.92}Ca_{16.32} \cdot Al_{48.00}Si_{71.84}O_{240} \cdot 64H_2O$	$F\,d\,d\,2$	17.6	NAT2000c01
microsommite	$Na_4K_2Ca_2 \cdot Al_6Si_6O_{24} \cdot 0.9SO_4\ 2.2Cl$	$P\,6_3/m$	15.6	CAN1995a02
	$Na_4K_2Ca_2 \cdot Al_6Si_6O_{24} \cdot 0.9SO_4\ 2.2Cl$	$P\,6_3$	15.9	CAN1995a01
montesommaite	$K_5 \cdot Al_5Si_{11}O_{32} \cdot 5H_2O$	$I\,4_1/a\,m\,d$	18.1	MON1990a02
mordenite	$Ca_{1.89}K_{0.14}Mg_{0.09}Na_{3.51} \cdot Al_{7.4}Fe_{0.03}Si_{40.53}O_{96} \cdot 27.26H_2O$	$C\,m\,c\,m$	17.2	MOR2003a01
mutinaite	$Ca_{3.8}K_{0.1}Mg_{0.2}Na_{2.8} \cdot Al_{11.2}Si_{84.9}O_{192} \cdot 60H_2O$	$P\,n\,m\,a$	17.6	MFI1997a01
nabesite	$Na_8 \cdot Be_4Si_{16}O_{40} \cdot 16H_2O$	$P\,2_1\,2_1\,2_1$	16.9	NAB2002a01
natrolite	$Na_{16} \cdot Al_{16}Si_{24}O_{80} \cdot 16H_2O$	$F\,d\,d\,2$	17.8	NAT1993b01
offretite	$KCaMg \cdot Al_5Si_{13}O_{36} \cdot 18H_2O$	$P\,\bar{6}\,m\,2$	15.4	OFF1996a01
pahasapaite	$Li_{11.6}Ca_{5.5}K_{1.2}Na_{0.2} \cdot Be_{24}P_{24}O_{96} \cdot 38H_2O$	$I\,2\,3$	18.3	RHO1989c01
paranatrolite	$Na_{15.04}K_{1.76}Ca_{0.48} \cdot Al_{17.92}Si_{22.08}O_{80} \cdot 24.8H_2O$	$F\,1\,d\,1$	16.7	NAT2004a01

Table 2.2.1 (continued)

mineral name	chemical composition	space group	FD	entry code
parthéite	$Ca_8 \cdot Al_{16}Si_{16}O_{68}H_8 \cdot 16H_2O$	$C\ 1\,2/c\ 1$	18.2	PAR1984a01
paulingite-K	$K_{68}Ba_{1.5}Ca_{36}Na_{13} \cdot Al_{152}Si_{520}O_{1344} \cdot 705H_2O$	$Im\bar{3}m$	15.5	PAU1966a01
paulingite-Ca	$Ba_2Ca_{59}K_{36}Na_{14} \cdot Al_{173}Si_{499}O_{1344} \cdot 550H_2O$	$Im\bar{3}m$	15.5	PAU1996a01
barian paulingite-Ca	$Ba_{22}Ca_{41}Fe_{0.5}K_{36}Mg_{0.6}Mn_{0.2}Na_6 \cdot Al_{185}Si_{489}Sr_2O_{1344} \cdot 434H_2O$	$Im\bar{3}m$	15.5	PAU1997a01
perlialite	$K_8Tl_4 \cdot Al_{12}Si_{24}O_{72} \cdot 20H_2O$	$P\,6/m\,m\,m$	16.1	LTL1990a01
phillipsite-K	$Ca_{1.7}K_{2.0}Na_{0.4} \cdot Al_{5.3}Si_{10.6}O_{32} \cdot 12H_2O$	$P\,1\,2_1/m\,1$	15.8	PHI1974a01
pitiglianoite	$Na_{18}K_6 \cdot Al_{18}Si_{18}O_{72} \cdot 3SO_4\ 6H_2O$	$P\,6_3$	16.3	CAN1991c01
pollucite	$Cs_{10}Na_3 \cdot Al_{14}Si_{34}O_{96} \cdot 4.5H_2O$	$Ia\bar{3}d$	18.8	ANA1995a01
	$Cs_{13}Na_2 \cdot Al_{15}Si_{33}O_{96} \cdot 32H_2O$	$I4_1/a\,c\,d$	18.7	ANA1995a02
quadridavyne	$Na_{16}K_4Ca_8 \cdot Al_{24}Si_{24}O_{96} \cdot 16Cl$	$P\,6_3/m$	15.5	CAN1994a01
roggianite	$Ca_{16} \cdot Be_8(OH)_{16}Al_{16}Si_{32}O_{104} \cdot 19H_2O$	$I\,4/m\,c\,m$	18.2	RON1991a01
scolecite	$Ca_8 \cdot Al_{16}Si_{24}O_{80} \cdot 24H_2O$	$F\,1\,d\,1$	17.5	NAT1997a01
tetranatrolite	$Na_{5.85}Ca_{1.90} \cdot Al_{9.25}Si_{10.75}O_{40.00} \cdot 10.96H_2O$	$I\bar{4}2\,d$	17.3	NAT2005a01
tiptopite	$K_2Li_{2.9}Na_{1.7}Ca_{0.7} \cdot Be_6P_6O_{24} \cdot 2OH\ 1.3H_2O$	$P\,6_3$	21.7	CAN1987a01
tschernichite	$Ca_4 \cdot Al_8Si_{24}O_{64} \cdot 32H_2O$[1])			BEA, [91Smi1, 93Bog1, 95Gal1]
vishnevite	$Na_8 \cdot Al_6Si_6O_{24} \cdot SO_4\ 2H_2O$	$P\,6_3$	16.6	CAN1984a01
wairakite	$Ca_7Na \cdot Al_{15}Si_{33}O_{96} \cdot 16H_2O$	$I\,1\,1\,2/a$	19.0	ANA1979a01
willhendersonite	$Ca_2K_2 \cdot Al_6Si_6O_{24} \cdot 10H_2O$	$P\bar{1}$	14.9	CHA1984c01
	$Ca_{2.9} \cdot Al_6Si_6O_{24} \cdot 11H_2O$	$P\bar{1}$	15.1	CHA1997a01

[1]) based on a tetragonal unit cell.

3 List of abbreviations

Just the abbreviations occurring in the text are listed. Further codes appearing in the Tables are explained in the corresponding chapters 8 to 15 of the introduction to volume B [2000Bau1].

a, **b**, **c**	Base vectors of the unit cell
a, b, c, α, β, γ	Unit cell constants [Å, °]
B	Isotropic displacement factor (temperature factor) [Å^2]
B_{eq}	Equivalent isotropic displacement factor [Å^2], calculated as explained in [88Fis1]
DLS	Distance Least Squares
DnR	Double ring consisting of two SnR's
e.s.d.	Estimated standard deviation
FD	Framework density defined as the number of tetrahedrally coordinated framework cations (T-atoms) per 1000 Å^3 [89Bru1].
FTC	Framework Type Code assigned by the SC-IZA.
i	*Klassengleiche* subgroups with identical space groups
IT	International Tables for Crystallography Vol. A [2002Hah1]
IZA	International Zeolite Association
k	*Klassengleiche* subgroups
n.p.d.	nonpositive definite

PU	Polyhedral Unit
SC-IZA	Structure Commission of the International Zeolite Association
SnR	Single ring containing n TX_4 tetrahedra
t	*Translationengleiche* subgroups
T	Tetrahedrally coordinated framework cation
x, *y*, *z*	Fractional coordinates
X	Anion in the coordination sphere of the framework cation
V	Unit cell volume [$Å^3$]
ZSC	Zeolite Structure Code formerly assigned by the SC-IZA (replaced by FTC).

4 Polyhedral units, 1D-units, and 2D-nets

All units are described in the manner of [2000Smi1]. In addition we use the units listed in Table 4.1. For explanations see volume A and chapter 8 in volume B of this series.

Table 4.1 Additional PU's not listed in [2000Smi1].

bb unit	face symbol	point symmetry	occurrence
bb01	$4^4 4^4 6^4 6^2 12^2$	2/*m*	ATS
bb02	$4^2 4^1 4^1 4^1 4^1 6^1 8^2 10^1$	*m*	AWO
bb03	$4^2 4^1 4^1 6^2 10^2$	*m m* 2	BOG
bb04	$4^2 10^2$	*m m m*	BOG, CON, LAU
bb05	$4^2 4^2 5^2 5^2 6^2 8^1 8^1 8^1 8^1$	*m*	BRE
bb06	$4^4 4^4 4^4 6^4 8^2 8^2$	2/*m*	CGF
bb07	$4^4 4^4 4^4 6^4 6^4 6^4 6^4 8^2 10^2$	2/*m*	CGF
bb08	$4^2 4^2 4^2 4^1 8^2 8^1 10^1 10^1$	*m*	CGS
bb09	$4^2 6^2 6^1$	2	CHI
bb10	$6^2 6^1 9^2 12^1$	2	CHI
bb11	$5^4 12^2 12^2$	2/*m*	CON
bb12	$6^4 6^4 14^2$	2/*m*	CFI
bb13	$4^2 5^4 6^2 12^2$	2/*m*	BEA, CON
bb14	$4^2 6^4 6^4 8^2 8^2$	2/*m*	AEN
bb15	$6^2 8^2 10^2$	*m m m*	DAC
bb16	$5^8 6^2 8^2 10^2$	*m m m*	DAC
bb17	$5^4 8^2 10^2$	*m m m*	DAC, FER
bb18	$4^2 4^1 5^2 6^2 6^1$	*m m* 2	DON
bb19	$6^4 6^2 12^2$	*m m m*	GON, MTW
bb20	$5^4 5^4 8^2 10^2$	2/*m*	HEU
bb21	$4^4 4^4 5^4 5^4 8^2 8^2$	2/*m*	HEU
bb22	$4^4 4^2 5^4 6^4 6^2 12^2$	2/*m*	IFR
bb23	$4^2 12^4$	4/*m m m*	ISV
bb24	$4^2 5^2 6^2 12^1$	*m m* 2	ISV
bb25	$4^4 4^2 5^4 5^4 6^4 6^4 12^4$	*m m m*	ISV
bb26	$4^2 5^4 6^4 12^2$	*m m m*	ISV
bb27	$4^4 4^2 6^4 6^2 6^2 10^2$	2/*m*	LAU
bb28	9^4	$\bar{4}$ 2 *m*	LOV, RSN

Table 4.1 (continued)

bb unit	face symbol	point symmetry	occurrence
bb29	$3^2 4^1 8^1 9^2$	*m m* 2	LOV, NAB, RSN
bb30	$8^2 10^4$	$\bar{4}$ 2 *m*	MEL
bb31	$5^2 5^4 8^2 8^2 10^2$	*m m* 2	MFS
bb32	$4^2 5^4 5^4 6^2 8^2 8^2$	2/*m*	MTF
bb33	$6^2 6^2 6^2 10^2$	*m m* 2	MTT
bb34	$5^{12} 6^{12} 6^2 10^6$	6/*m m m*	MWW
bb35	$4^2 5^4 5^4 10^2$	*m m m*	MWW
bb36	$4^1 4^1 4^2 4^2 5^2 5^2 6^1 6^1 6^2 6^2 8^1 8^1$	*m*	RTE (type B)
bb37	$5^8 5^8 5^4 5^4 6^8 10^4$	*m m m*	NES
bb38	$3^4 3^4 3^4 3^4 8^4 8^4 14^2$	2 2 2	OSO
bb39	$4^2 4^2 6^2$	2	PON
bb40	$4^8 6^8 8^2$	$\bar{8}$ 2 *m*	RTE (type C)
bb41	$4^4 5^8 6^4 8^2$	$\bar{4}$ 2 *m*	RTE (type C)
bb42	$4^1 5^2 5^2 5^2 6^1 10^1 10^1$	*m*	MEL, MFI
bb43	$5^4 5^4 10^2$	2/*m*	MFI
bb44	$3^2 6^3$	$\bar{6}$ 2 *m*	NPO
bb45	$5^2 5^2 5^2 8^1 12^2$	*m m* 2	MOR
bb46	$5^4 6^4 12^2$	*m m m*	MTW
bb47	$3^4 3^4 3^4 4^1 8^4 8^1 10^4$	4 *m m*	OBW
bb48	$5^2 5^2 6^4 8^2$	2/*m*	NSI
bb49	$4^2 4^1 4^1 8^2 8^2 8^2$	*m m* 2	OWE
bb50	$6^2 8^2$	*m m m*	OWE

5 Chemistry

In addition to the specifications given in chapter 10.2 of volume B [2000Bau1] the letter code R is introduced in the column for thermal treatment in Tables FTC.1.1 indicating rehydration of a dehydrated sample.

Table 5.1 List of sorbates and templates in entries of volumes B to D of this series.

code	description	chemical composition		occurrence
ABH	(±)-exo-2-aminobicyclo[2.2.1]heptane	$C_7H_{13}N$	$C_7H_{13}N$	RTE
1-Ada	1-adamantylamine	$C_{10}H_{17}N$	$C_{10}H_{17}N$	DDR, DOH, LEV
1-AdaOH	N,N,N-trimethyl-1-adamantylammonium hydroxide	$C_{10}H_{16}N(CH_3)_3OH$	$C_{13}H_{26}NO$	AFI
1-cb	1-chlorobutane	C_4H_9Cl	C_4H_9Cl	FAU
1-MI	1-methylimidazole	$C_3H_3N_2CH_3$	$C_4H_6N_2$	CHA

Table 5.1 (continued)

code	description	chemical composition		occurrence
1-propylamine	1-propylamine	$C_3H_7NH_2$	C_3H_9N	FER
1,2-dibromoethane	1,2-dibromoethane	C_2H_4B	C_2H_4B	LTA
1,6-dichlorohexane	1,6-dichlorohexane	$C_6H_{12}Cl_2$	$C_6H_{12}Cl_2$	MFI
18-crown-6	1,4,7,10,13,16-hexaoxacyclooctadecane	$C_{12}H_{24}O_6$	$C_{12}H_{24}O_6$	EMT, MSO
2-aminopentane	2-aminopentane	$CH_3CH(NH_2)C_3H_7$	$C_5H_{13}N$	NON
2-MCHA$^+$	protonated 2-methyl-cyclohexylammonium$^+$	$C_6H_{10}CH_3NH_3^+$	$C_7H_{16}N$	LEV
2-methyl naphthalene	2-methylnaphthalene	$C_{11}H_{10}$	$C_{11}H_{10}$	MFI
[2.2]cryptand	1,7,10,16-tetraoxa-4,13-diazacyclooctadecane	$C_{12}H_{28}N_2O_4^{2+}$	$C_{12}H_{28}N_2O_4$	MSO
[2.2.2]cryptand	hexacosa-4.7.13.16.21.24-diaza-1.10-bicyclo[8,8,8]hexacosane^{2+}	$C_{18}H_{38}N_2O_6^{2+}$	$C_{18}H_{38}N_2O_6$	LTA
acetone	Acetone	C_3H_6O	C_3H_6O	FAU
acetonitrile	acetonitrile	CH_3CN	C_2H_3N	LTA
acetylene	Acetylene	C_2H_2	C_2H_2	FAU, LTA
ammonia	Ammonia	NH_3	NH_3	FAU, LTA
aniline	aniline	C_6H_7N	C_6H_7N	FAU
BQ	benzylquinuclidinium$^+$	$C_{14}H_{20}N$	$C_{14}H_{20}N$	IFR
BQol	benzylhydroxyquinuclidinium$^+$	$C_{14}H_{19}(OH)N$	$C_{14}H_{20}NO$	IFR
benzene	benzene	C_6H_6	C_6H_6	FAU, LTL, MTW
BT	bithiophene	$C_8H_6S_2$	$C_8H_6S_2$	MFI
butadiene	butadiene	$CH_2CHCHCH_2$	C_4H_6	FAU
cHA	cyclohexylamine	$C_6H_{11}NH_2$	$C_6H_{13}N$	CHA
chloroform	chloroform	$CHCl_3$	$CHCl_3$	FAU
cyclohexane	cyclohexane	C_6H_{12}	C_6H_{12}	FAU
cyclopropane	cyclopropane	C_3H_6	C_3H_6	FAU, LTA
cyclotriazane	cyclotriazane	N_3H_3	N_3H_3	LTA
Co(DETA)$_2$	Co-Bis(diethylenetriamine)	$Co((NH_2C_2H_4)_2NH)_2^{3+}$	$C_8H_{26}N_6Co$	CHA
Co(MCpD)$_2$F	Co-Bis(methylcyclopentadienyl) fluoride	$Co(C_5H_4CH_3)_2F$	$C_{12}H_{14}CoF$	DOH
(Cp)$_2$CoF	cobaltocenium fluoride	$CoF(C_5H_5)_2$	$C_{10}H_{10}CoF$	NON
(Cp)$_2$CoOH	bis(pentamethylcyclopentadienyl) cobalt(III) hydroxide	$CoF_{0.75}(OH)_{0.25}C_{20}H_{30}$	$C_{20}H_{30}CoF_{0.75}(OH)_{0.25}$	DON
DABCO	1,4-diazabicyclo[2,2,2]-octane (triethylenediamine)	$C_6H_{12}N_2$	$C_6H_{12}N_2$	AST, CGF
DDPOH	N,N-diethyl-3,5-dimethylpiperidinium hydroxide	$(C_2H_5)_2NC_5H_8(CH_3)_2OH$	$C_{11}NH_{25}O$	MEL
deuterobenzene	deuterobenzene	C_6D_6	C_6D_6	MFI
dibromobutane	dibromobutane	$C_4H_8Br_2$	$C_4H_8Br_2$	FAU
dichloro-benzene	dichlorobenzene	$C_6H_4Cl_2$	$C_6H_4Cl_2$	FAU
dinitrobenzene	dinitrobenzene	$C_6H_4(NO_2)_2$	$C_6H_4N_2O_4$	FAU
DiPDAP	N,N'-diisopropyl-1,3-diaminopropane	$(CH_3)_2CHNH_2(CH_2)_3NH_2CH(CH_3)_2^{2+}$	$C_9H_{24}N_2$	RHO

Table 5.1 (continued)

code	description	chemical composition		occurrence
DM	decamethonium^{2+}	$C_{16}H_{38}N_2^{2+}$	$C_{16}H_{38}N_2$	DFO
dodecane	dodecane	$CH_3(CH_2)_{10}CH_3$	$C_{12}H_{26}$	MFI
DPA	dipropylamine	$(C_3H_7)_2NH$	$C_6H_{15}N$	AEL, AFS, AFY, ATN, ATO, LTA
EAN	ethanolamine	$HO\text{-}CH_2CH_2\text{-}NH_2$	C_2H_7NO	APD, AWO
EDA	ethylenediamine (diaminoethane)	$H_2N\text{-}C_2H_4\text{-}NH_2$	$C_2H_8N_2$	ACO, AEN, AWO, FAU, FER, MER
EtOH	ethanol	C_2H_6O	C_2H_6O	FAU
ethylene	ethylene	C_2H_4	C_2H_4	FAU, LTA
ferrocene	ferrocene	$Fe(C_5H_5)_2$	$FeC_{10}H_{10}$	FAU
guanidinium	guanidinium	CH_6N_3	CH_6N_3	GIS
HCFC-124a	hydrochlorofluorocarbon-124a	CF_2HCF_2Cl	C_2HF_4Cl	FAU
hcha	protonated cyclohexylamine$^+$	$C_6H_{11}NH_3^+$	$C_6H_{14}N$	CHA
HDAB14	diprotonated 1,4-diaminobutane	$C_4H_{14}N_2^{2+}$	$C_4H_{14}N_2$	OWE
HDAMP	diprotonated 1,2-diamino-2-methylpropane	$C_4H_{14}N_2^{2+}$	$C_4H_{14}N_2$	EDI
HDAP12	diprotonated 1,2-diaminopropane	$C_3H_{12}N_2^{2+}$	$C_2H_{12}N_2$	EDI
HDAP13	diprotonated 1,3-diaminopropane	$C_3H_{12}N_2^{2+}$	$C_3H_{12}N_2$	EDI, GIS
HDMA	protonated dimethylamine$^+$	$(CH_3)_2NH_2^+$	C_2H_8N	GIS, HEU, RHO
HDPA	protonated dipropylamine$^+$	$(C_3H_7)_2NH_2^+$	$C_6H_{16}N$	GIS
HEDA	protonated ethylenediamine$^+$	$H_2N\text{-}C_2H_4\text{-}NH_3^+$	$C_2H_9N_2$	GIS
H_2EDA	diprotonated ethylenediamine^{2+}	$H_3N^+\text{-}C_2H_4\text{-}NH_3^{2+}$	$C_2H_{10}N_2$	DFT, GIS, MFI
HETA	protonated diethylenetriamine$^+$	$C_4H_{14}N_3^+$	$C_4H_{14}N_3$	OWE
hexane	hexane	$CH_3(CH_2)_4CH_3$	C_6H_{14}	MFI, MTW
H_2DAH	diprotonated diamino hexane$^+$	$H_3N^+\text{-}C_6H_{12}\text{-}NH_3^+$	$C_6H_{18}N_2$	KFI
HFC-134	hydrofluorocarbon-134	$HF_2C_2F_2H$	$C_2H_2F_4$	FAU
HiPA	protonated isopropylamine$^+$	$(CH_3)_2CHNH_3^+$	$C_3H_{10}N$	AFN, FAU
HMEA	protonated monoethylamine$^+$	$C_2H_5NH_3^+$	C_2H_8N	FAU, HEU
HMMA	protonated monomethylamine$^+$	$CH_3NH_3^+$	CH_6N	AEN, FAU, GIS, HEU, PON, RHO
HMMA(D)	deuterated monomethylamine$^+$	$CD_3ND_3^+$	CD_6N	RHO
HnPA	protonated n-propylamine	$C_3H_7NH_3^+$	$C_3H_{10}N$	HEU
H_2PMDA	diprotonated pentamethylenediamine	$H_3N\text{-}C_5H_{10}\text{-}NH_3$	$C_5H_{16}N_2$	PHI
HPyr	protonated pyrrolidine	$C_4H_8NH_2^+$	$C_4H_{10}N$	GIS, NON
HPyridine	protonated pyridine$^+$	$C_5H_5NH^+$	C_5H_6N	LAU
hquin	protonated quinuclidine	$(C_2H_4)_3NHCH^+$	$C_7H_{14}N$	CGS, DDR
H_3tETA	triprotonated triethylene tetramine	$C_6H_{21}N_4^{3+}$	$C_6H_{21}N_4$	GME
HTrMA	protonated trimethylamine	$(CH_3)_3NH^+$	$C_3H_{10}N$	RHO
HTrMA(D)	deuterated trimethylamine	$(CD_3)_3ND^+$	$C_3D_{10}N$	RHO
imidazole	imidazole$^+$	$C_3H_5N_2^+$	$C_3H_5N_2$	LAU
iPA	isopropylamine	$(CH_3)_2CHNH_2$	C_3H_9N	AWO, CHA, GIS

Table 5.1 (continued)

code	description	chemical composition		occurrence
MBA	methylbutylamine	$C_4H_9NHCH_3$	$C_5H_{13}N$	CHA
m-deb	m-dichlorobenzene	$C_6H_4Cl_2$	$C_6H_4Cl_2$	FAU
mesytylene	1,3,5-trimethyl-benzene	$C_6H_3(CH_3)_3$	C_9H_{12}	FAU
methanol	methanol	CH_3OH	CH_4O	LTA
methylene blue	methylene blue	$(H_3C)_2HNC_6H_3NS\_C_6H_3N(CH_3)_2$	$C_{16}H_{16}N_3S$	FAU
methylene blue$^+$	methylene blue$^+$	$C_{16}H_{18}N_3S^+$	$C_{16}H_{18}N_3S$	MOR
methylpyrrole	methylpyrrole	C_5H_7N	C_5H_7N	FAU
MMA	monomethylamine	CH_3NH_2	CH_5N	PON
mor	morpholine$^+$	$(C_2H_4)_2ONH_2^+$	$C_4H_{10}NO$	CHA
MS	methyl sulfide	CH_3S	CH_3S	LTA
n-butene	n-butene	C_4H_8	C_4H_8	FAU
naphthalene	naphthalene	$C_{10}H_8$	$C_{10}H_8$	FAU, MFI
nitroaniline	nitroaniline	$NO_2C_6H_4NH_2$	$C_6H_6N_2O_2$	FAU, MFI, MTW
n-Mquin	N-methylquinuclidine	$(C_2H_4)_3NCHCH_3$	$C_8H_{16}N$	LEV
octane	octane	$CH_3(CH_2)_6CH_3$	C_8H_{18}	MFI
P3BZY	tripropylbenzylammonium$^+$	$(C_3H_7)_3NCH_2C_6H_5^+$	$C_{16}H_{28}N$	MFI
pdcb	p-dichlorobenzene	C6H4Cl2	C6H4Cl2	MFI
piperazine	piperazine	$C_4H_{12}N_2$	$C_4H_{12}N_2$	GIS
piperidine	piperidine	$C_5H_{10}NH$	$C_5H_{11}N$	DOH, ERI
PMDA	pentamethylenediamine	$H_2N\text{-}C_5H_{10}\text{-}NH_2$	$C_5H_{14}N_2$	CHA
Pyr	pyrrolidine	C_4H_8NH	C_4H_9N	AWO,MTN
pyridine	pyridine	C_5H_5N	C_5H_5N	CHA, FAU, FER, LTL, MFI, MTN
quin	quinuclidine	$(C_2H_4)_3NCH$	$C_7H_{13}N$	AST, AWW, DDR
quinF	quinuclidinium fluoride	$(C_2H_4)_3NHCHF$	$C_7H_{14}FN$	CLO
stilbene	stilbene	$C_{14}H_{12}$	$C_{14}H_{12}$	MFI
t-but	tert-butylamine	$C(CH_3)_3NH_2$	$C_4H_{11}N$	MTN
TCNQ	7,7,8,8-tetracyano-p-quinodimethane	$C_{12}H_4N_4$	$C_{12}H_4N_4$	FAU
tEA	triethylamine	$(C_2H_5)_3N$	$C_6H_{15}N$	AFI
TEA	tetraethylamine$^+$	$(C_2H_5)_4N^+$	$C_8H_{20}N$	AFT, CHA, LTA, MER, MTN
TEAOH	tetraethylamine hydroxide	$(C_2H_5)_4NOH$	$C_8H_{21}NO$	AEI
THF	tetrahydrofuran	$(CH_2)_4O$	C_4H_8O	MTN
thioindigo	thioindigo	$C_6H_4COSC_2SCOC_6H_4$	$C_{16}H_8O_2S_2$	FAU
thionin blue	thionin blue$^+$	$C_{12}H_{10}N_3S^+$	$C_{12}H_{10}N_3S$	MOR
TMA	tetramethylamine$^+$	$(CH_3)_4N^+$	$C_4H_{12}N$	CHA, EAB, FAU, GIS, MAZ, MTN
TMAF	Tetramethylamine fluoride	$(CH_3)_4NF$	$C_4H_{12}NF$	MTN
tMB	trimethylbenzene	C_9H_{12}	C_9H_{12}	FAU
TMAOH	tetramethylamine hydroxide	$(CH_3)_4NOH$	$C_4H_{13}NO$	ATT
TMPD	tetramethylpropanediamine	$C_3H_6(N(CH_3)_2)_2$	$C_7H_{18}N^2$	AWO

Table 5.1 (continued)

code	description	chemical composition		occurrence
toluene	methyl-benzene	$C_6H_5CH_3$	C_7H_8	FAU, MFI
TPA	tetrapropylammonium$^+$	$(C_3H_7)_4N^+$	$C_{12}H_{28}N$	MFI
TPAF	tetrapropylamine fluoride	$(C_3H_7)_4NF$	$C_{12}H_{28}FN$	AFI, MFI
TPAOH	tetrapropylamine hydroxide	$(C_3H_7)_4NOH$	$C_{12}H_{29}NO$	AFI, AFR, MFI
triazane	triazane	N_3H_5	N_3H_5	LTA
TrMA	trimethylamine	$(CH_3)_3N$	C_3H_9N	MTN, RHO
TTEAMBOH	1,3,5-tris(triethylammonium-methyl)benzenehydroxide	$C_6H_3(CH_2N(C_2H_5)_3)_3(OH)_3$	$C_{27}H_{57}N_3O_3$	BPH
TTF	tetrathiafulvalene	$C_6H_4S_4$	$C_6H_4S_4$	FAU
xylene	dimethyl-benzene	C_8H_{10}	C_8H_{10}	FAU, MFI

Fig. 5.1 shows the updated compilation of chemical elements occurring in all zeolites treated in volumes B, C and D. Tables 5.2 and 5.3 refer only to compounds covered in volume D.

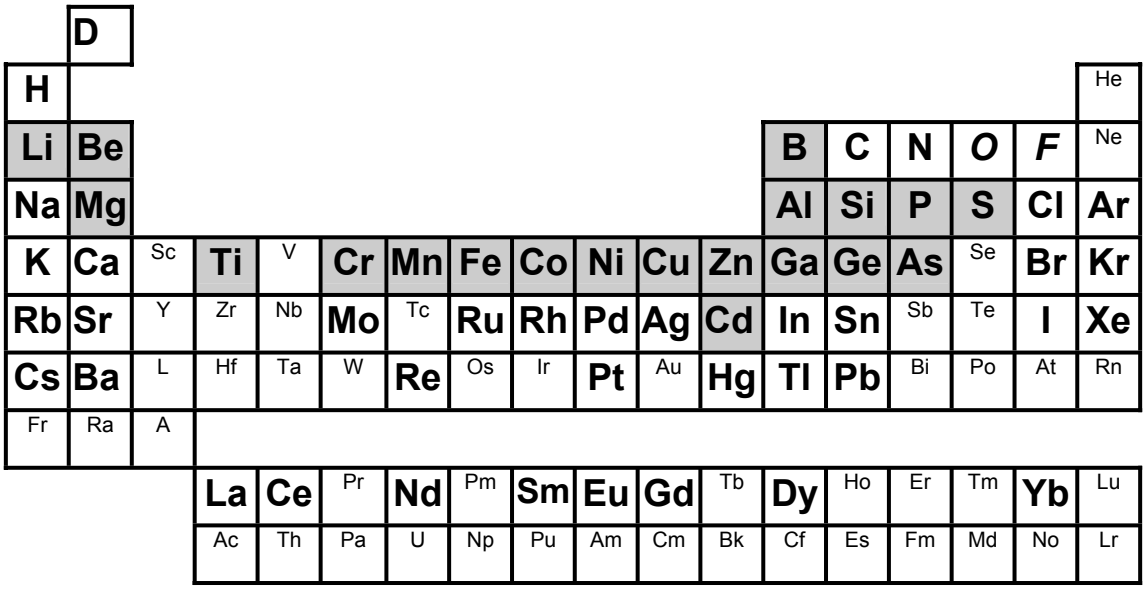

Fig. 5.1 Chemical elements (highlighted) occurring in all entries of volumes B to D with FTC's from ABW to RHO. Framework cations are in grey fields. Some of the framework atoms can also occur as exchangeable cations.

Table 5.2 Occurrence of framework cations in the crystal structures listed in volume D of this series.

	Li	Be	Mg	B	Al	Ga	Si	Ge	P	As	S	Ti	Cr	Mn	Fe	Co	Ni	Cu	Zn	Cd
LTA					■	■	■		■										■	
LTL					■	■	■		■						■					
LTN					■		■													
MAR					■		■													
MAZ					■	■	■													
MEI					■		■		■											
MEL					■	■	■													
MEP							■													
MER		■			■		■		■							■				
MFI	■			■	■		■					■			■					
MFS					■		■													
MON					■		■	■												
MOR					■		■								■					
MOZ					■		■													
MSO					■		■		■											
MTF							■													
MTN							■													
MTT					■		■													
MTW					■		■													
MWW				■	■		■													
NAB		■					■													
NAT					■	■	■	■				■			■					
NES					■		■													
NON				■			■													
NPO									■											
NSI							■													
OBW		■					■													
OFF					■		■													
OSI					■				■											
OSO		■					■													
OWE			■		■	■			■							■				
PAR					■		■													
PAU					■		■								■					
PHI					■		■		■							■				
PON					■				■											
RHO		■	■		■	■	■	■	■	■				■		■				

Table 5.3 Occurrence of nonframework cations in the crystal structures listed in volume D (FTC: LTA to RHO) of this series. The last column refers to the organic molecules and cations as listed in Table 5.1.

	H/D	Li	Na	K	Rb	Cs	Mg	Ca	Sr	Ba	Al	Tl	Mn	Fe	Co	Ni	Cu	Ag	Cd	NH_4	org
LTA[1])	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LTL	■		■	■		■			■	■		■									■
LTN	■		■																		
MAR			■	■				■													
MAZ			■	■			■	■													■
MEI	■																				
MEL			■																		■
MEP																					■
MER			■	■				■		■										■	■
MFI	■	■	■	■		■	■	■				■				■					■
MFS	■																				
MON				■																	
MOR[2])	■		■	■	■	■	■	■	■	■							■				
MOZ	■																				
MSO				■																	■
MTF																					
MTN																					■
MTT																					■
MTW																					■
MWW	■		■																		
NAB			■																		
NAT		■	■	■	■		■	■	■	■										■	
NES			■	■			■	■													
NON															■						■
NPO	■	■																			
NSI																					
OBW				■																	
OFF				■			■	■													
OSI																					
OSO				■																	
OWE																				■	■
PAR								■													
PAU			■	■			■	■	■	■			■	■							
PHI		■	■	■		■	■	■	■	■										■	■
PON																					■
RHO[2])	■	■	■	■	■	■		■	■	■		■						■	■	■	■

[1]) and: B, In, Pb, Zn, Eu
[2]) and: Pb

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