

Mineral statistics

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For mineralogists and mineral collectors who are statistically inclined, the number of valid mineral species at any given time is always of interest, as is the breakdown of these species by chemical groups and according to representation of various elements in mineral formulas. A recent article published in Russian (Yaroshevsky 2003) presents this interesting information on mineral species considered valid to the end of 2001. Since it may be of interest to our members, the information was updated and expanded to the present (approximately to mid-2003). The updated classification of species is shown in Table 1. The data presented by Yaroshevsky on the chemical elements represented in mineral formulas was completely resorted and retabulated. Revision and reworking was necessary to bring the data up to date, to correct some discrepancies, and to give a full breakdown of the rare-earth elements (Y + REE), which were grouped together in a single entry in the Yaroshevsky paper. Data shown in Table 2 were extracted electronically from web-based mineral databases (both MINDAT and Athena), and for the new species not yet included in the databases, manually from original descriptions and related literature (Mandarino 2003, Martin 2003). The inherent problem here of course is the integrity and completeness of data in the databases used; therefore the numbers presented here are as accurate as the databases used. Another problem which may affect data in Table 2 involves the differences in mineral formulas, which change and evolve over time, and may vary from one reference or database to the next. For example, of the standard references, Gaines *et al.* (1997) give the following formula for the mineral leucophanite: $\text{CaNaBe}(\text{Si}_2\text{O}_8\text{F})$, Anthony *et al.* (1995) give $(\text{Ca,Ce})\text{CaNa}_2\text{Be}_2\text{Si}_4\text{O}_{12}(\text{F,OH})_2$, and Mandarino (1999) gives $(\text{Ca,REE})\text{CaNa}_2\text{Be}_2\text{Si}_4\text{O}_{12}(\text{F,O})$. A search for elements in a database using data in Gaines *et al.* (1997) will not show Ce and H, one based on Mandarino (1999) may or may not show Ce and will not show H, whereas that based on Anthony *et al.* (1995) will show both Ce and H.

The number of valid and published species given by Yaroshevsky to the end of 2001 is 3966 species. The 2002 and partial 2003 additions (Martin 2003) bring this number to 4051. Considered valid are those published species that were approved or “grandfathered” by IMA CNMMN. The estimated 40 to 60+ recently (or not so recently) approved but unpublished species are not included in the data presented here.

References

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Table 1. Chemical classification of minerals

Minerals	Number of species	% of total
Elements and alloys	94	2.32
Carbides	7	0.17
Nitrides	10	0.25
Phosphides	8	0.20
Silicides	5	0.12
Sulfides, selenides and tellurides	287	7.09
Arsenides, antimonides and bismuthides	70	1.72
Sulfosalts	248	6.12
Fluorides	52	1.28
Chlorides	82	2.02
Bromides	7	0.17
Iodides	6	0.15
Oxides	269	6.64
Hydroxides	198	4.88
Nitrates	16	0.40
Borates	137	3.38
Carbonates	203	5.02
Iodates	11	0.27
Sulfates	298	7.35
Selenites and selenates	21	0.52
Tellurites and tellurates	53	1.31
Chromates	12	0.30
Phosphates	409	10.10
Arsenites and arsenates	255	6.30
Vanadates	80	1.98
Molydates	26	0.64
Tungstates	13	0.32
Silicates	1136	28.04
Organic minerals	38	0.94
Total	4051	100

Table 2. Elements represented in mineral formulas

Element	Atomic number	Rank	Number of species	Element	Atomic number	Rank	Number of species	Element	Atomic number	Rank	Number of species
H	1	2	2226	Cu	29	10	516	La	57	40	80
Li	3	35	91	Zn	30	20	225	Ce	58	26	165
Be	4	34	94	Ga	31	65*	5	Pr	59	64*	2
B	5	23	217	Ge	32	52	20	Nd	60	48	39
C	6	16	334	As	33	13	454	Sm	62	61*	5
N	7	42	75	Se	34	32	104	Gd	64	59	7
O	8	1	3249	Br	35	54*	15	Dy	66	61*	5
F	9	17	281	Rb	37	62*	3	Er	66	64*	2
Na	11	8	703	Sr	38	33*	103	Yb	70	60	6
Mg	12	9	647	Y	39	33*	103	Hf	72	62*	3
Al	13	7	834	Zr	40	39	85	Ta	73	41	77
Si	14	3	1176	Nb	41	31	129	W	74	49	34
P	15	12	474	Mo	42	48	40	Os	76	58	10
S	16	6	878	Ru	44	54*	15	Ir	77	51*	21
Cl	17	18	280	Rh	45	53*	16	Pt	78	45	44
K	19	15	359	Pd	46	44	59	Au	79	50	30
Ca	20	5	1014	Ag	47	29	136	Hg	80	37	88
Sc	21	57	11	Cd	48	53*	16	Tl	81	46	43
Ti	22	19	259	In	49	56	12	Pb	82	14	425
V	23	28	153	Sn	50	36	89	Bi	83	24	187
Cr	24	38	84	Sb	51	21	224	Th	90	47	41
Mn	25	11	507	Te	52	30	135	U	92	22	218
Fe	26	4	1036	I	53	51*	21				
Co	27	43	61	Cs	55	55	14				
Ni	28	27	157	Ba	56	25	180				

Total number of elements represented in mineral formulas: 72

Note: the * after numbers denotes ranking shared with one or more elements.