



Kimia Unsur *Chemical Elements*

Meeting - 10
Every Thursday
at 7 – 9.30 am

**Dr.paed. Nurma Yunita Indriyanti, M.Si., M.Sc.
2016**

Tentative Schedule: Tentative lecture topic coverage, subject to change.

Meeting	Date	Topic
9	25-10-2016	Refresh: Studium General "Chemistry in Context"
10	03-11-2016	Introduction, Hydrogen
	10-11-2016	
11	17-11-2016	Group 1A, IIA (1,2)
12	24-11-2016	Group IIIA, IVA (13,14)
13	01-12-2016	Group VA, VIA (15,16)
14	08-12-2016	Group VIIA, VIIIA (17,18)
15	15-12-2016	Group IB,IIB, IIIB (3,11,12)
16	22-12-2016	Group IVB, VB, VIB (4,5,6)
17	29-12-2016	Group VIIB-VIIIB (7,8,9,10)
18	05-01-2017	Final Exam

Periodic table of elements

IUPAC Periodic Table of the Elements																	18	
1 H hydrogen [1.007, 1.009]																	2 He helium 4.003	
3 Li lithium [6.938, 6.997]	4 Be beryllium 9.012											5 B boron [10.80, 10.83]	6 C carbon [12.00, 12.02]	7 N nitrogen [14.00, 14.01]	8 O oxygen [15.99, 16.00]	9 F fluorine 19.00	10 Ne neon 20.18	
11 Na sodium 22.99	12 Mg magnesium [24.30, 24.31]												13 Al aluminium 26.98	14 Si silicon [28.06, 28.09]	15 P phosphorus 30.97	16 S sulfur [32.05, 32.08]	17 Cl chlorine [35.44, 35.46]	18 Ar argon 39.95
19 K potassium 39.10	20 Ca calcium 40.08	21 Sc scandium 44.96	22 Ti titanium 47.87	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.69	29 Cu copper 63.55	30 Zn zinc 65.38(2)	31 Ga gallium 69.72	32 Ge germanium 72.63	33 As arsenic 74.92	34 Se selenium 78.97	35 Br bromine [79.90, 79.91]	36 Kr krypton 83.80	
37 Rb rubidium 85.47	38 Sr strontium 87.62	39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.95	43 Tc technetium	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3	
55 Cs caesium 132.9	56 Ba barium 137.3	57-71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium [204.3, 204.4]	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium	85 At astatine	86 Rn radon	
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Uut ununtrium	114 Fl flerovium	115 Uup ununpentium	116 Lv livermorium	117 Uus ununseptium	118 Uuo ununoctium	

Key:

atomic number
Symbol
name
standard atomic weight



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57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.0	71 Lu lutetium 175.0
89 Ac actinium	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium

For notes and updates to this table, see www.iupac.org. This version is dated 8 January 2016.
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Periodic Table of the Elements

[illegible]

★ Lanthanide Series

+ Actinide Series

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

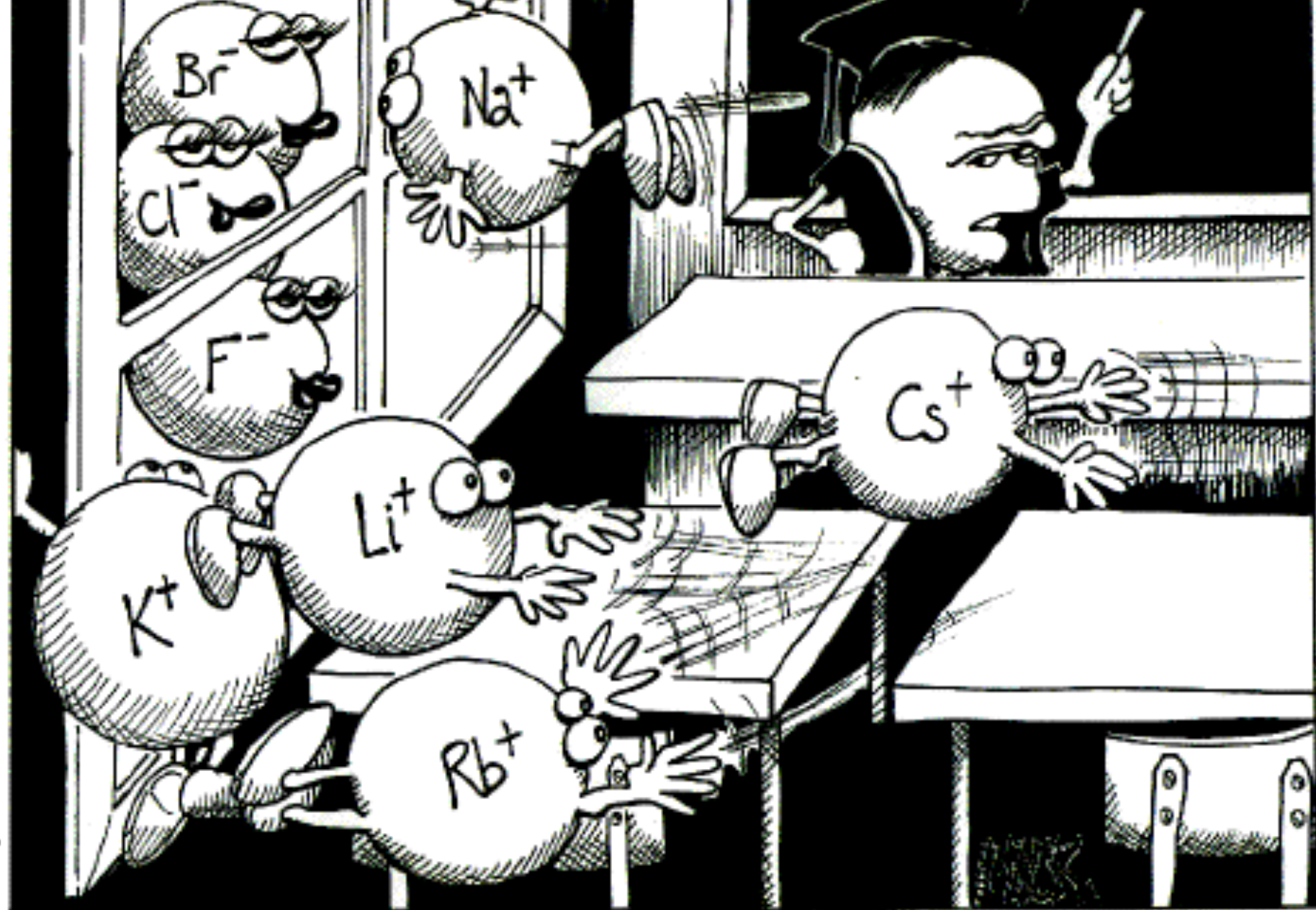
Discussion

- Which hydrogen bond would you expect to be stronger, S-H.....O or O-H.....S?
- Describe the expected physical properties of water in the absence of hydrogen bonding.

IUPAC def (2011)

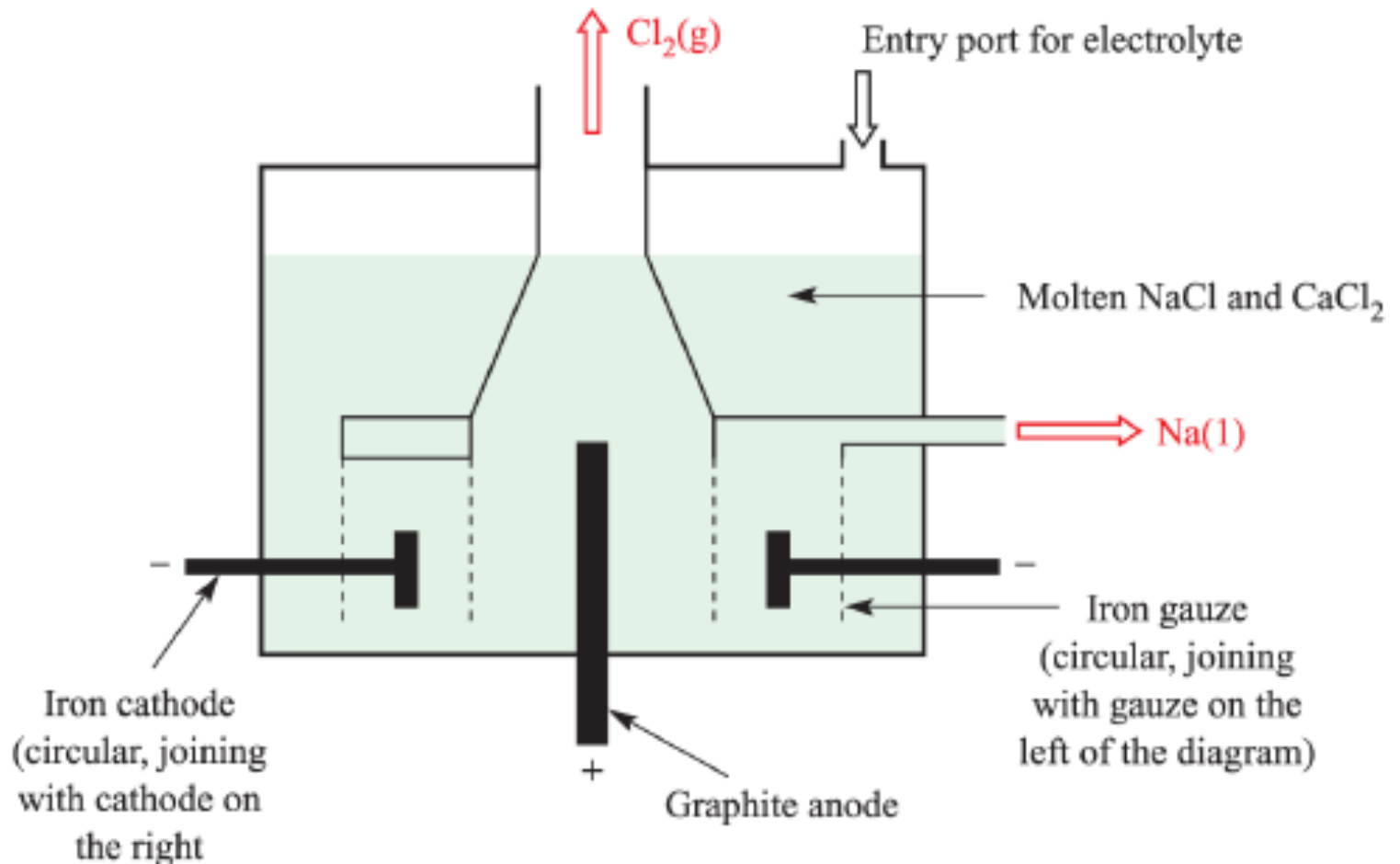
- The hydrogen bond is an attractive interaction between a hydrogen atom from a molecule or a molecular fragment X–H in which X is more electronegative than H, and an atom or a group of atoms in the same or a different molecule, in which there is evidence of bond formation.^[6]

Alkali Metals and Earth Alkali



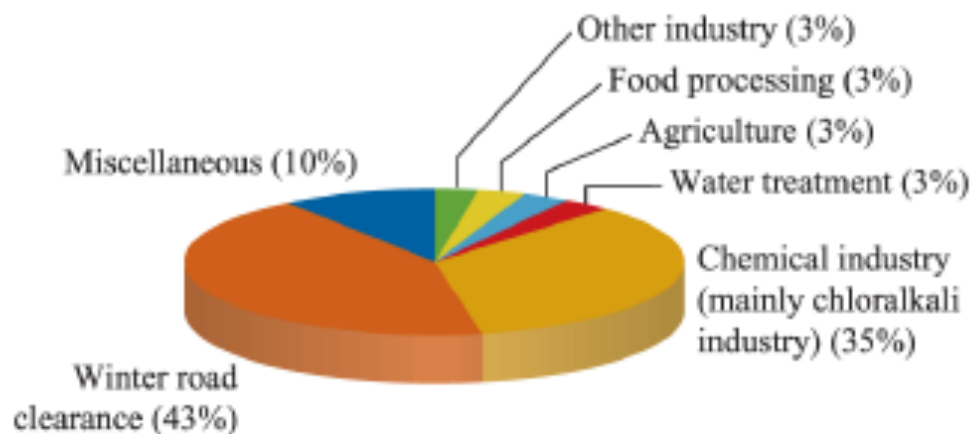
"Perhaps one of you gentlemen would mind telling me just what it is outside the window that you find so attractive...?"

Down's Process



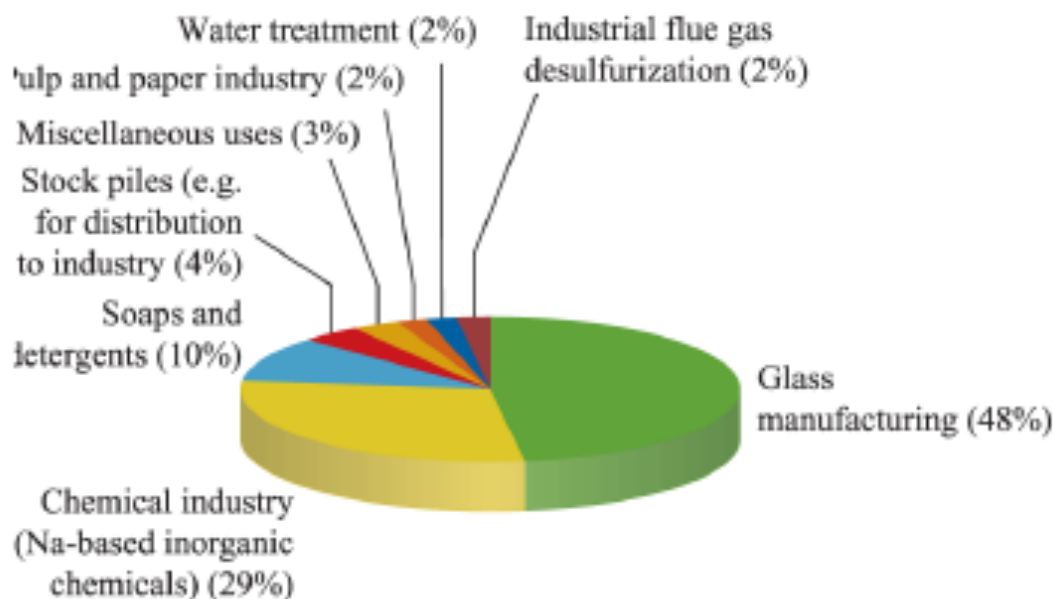
Uses of Sodium

NaCl



(a)

Na_2CO_3



Flame Test



Li



Na



Cs

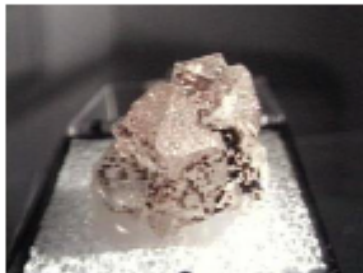
Earth Alkali

Dolomite
 $\text{CaCO}_3:\text{MgCO}_3$

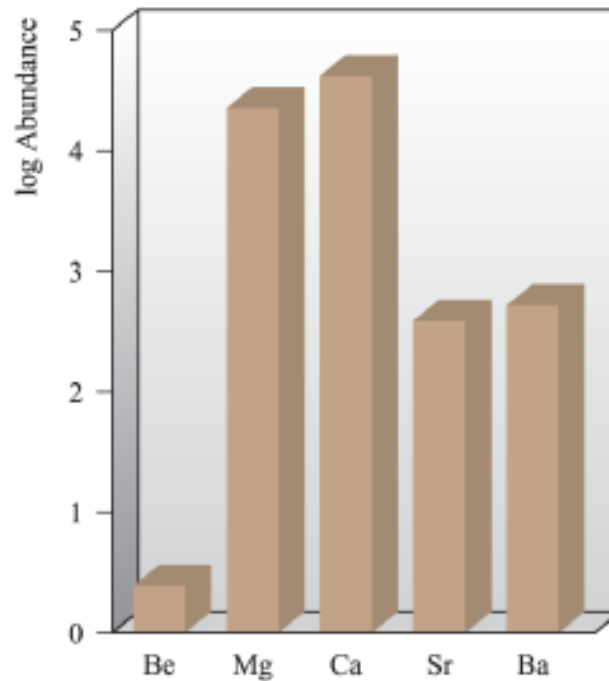


<http://mineral.galleries.com/minerals/carbonat/dolomite/dolomite.htm>

Magnesite MgCO_3



<http://mineral.galleries.com/minerals/carbonat/magnesit/magnesit.htm>



Relative abundances in the Earth's crust of the alkaline earth metals

Olivine
 $(\text{Mg,Fe})_2\text{SiO}_4$



<http://mineral.galleries.com/Minerals/Silicate/OLIVINE/OLIVINE.htm>

Celestite
 SrSO_4

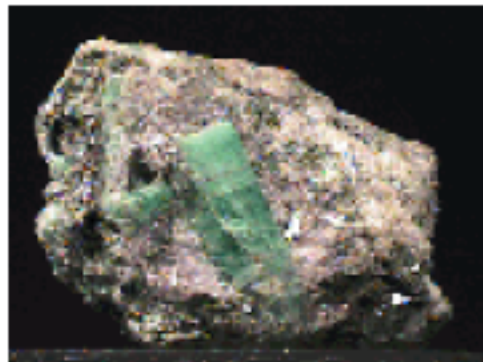


<http://www.galleries.com/minerals/sulfates/celestite/celestite.htm>

Beryllium

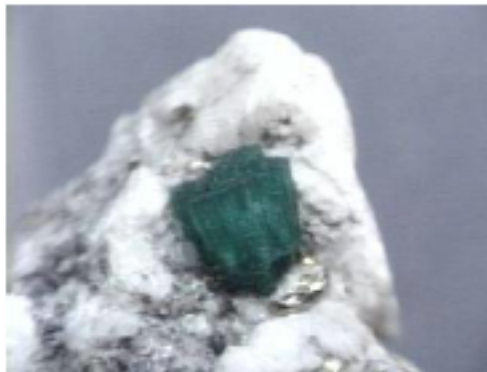
- Small size and high charge density in Be^{2+}
- Be is the only group 2 element that does not form a stable complex with $[\text{EDTA}]^{4-}$.
- Beryllium compounds tend to be covalent
- Beryllium occurs in the silicate mineral beryl $\text{Be}_3\text{Al}_2[\text{Si}_6\text{O}_{18}]$, and emerald and aquamarine.

Beryl



<http://mineral.galleries.com/minerals/silicate/beryl/beryl.htm>

Emerald

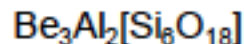


<http://mineral.galleries.com/minerals/GEMSTONE/EMERALD/EMERALD.htm>

X-ray Window



<http://www.berylliumproducts.com/CommercialXray.aspx>

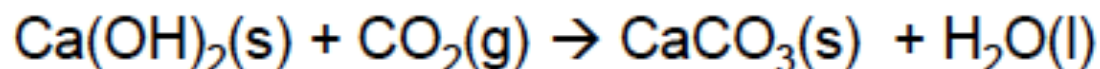
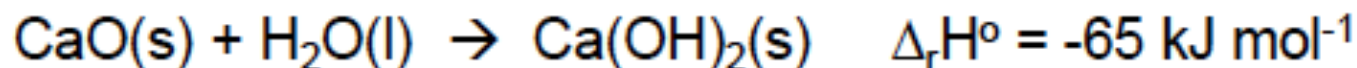


Flame test

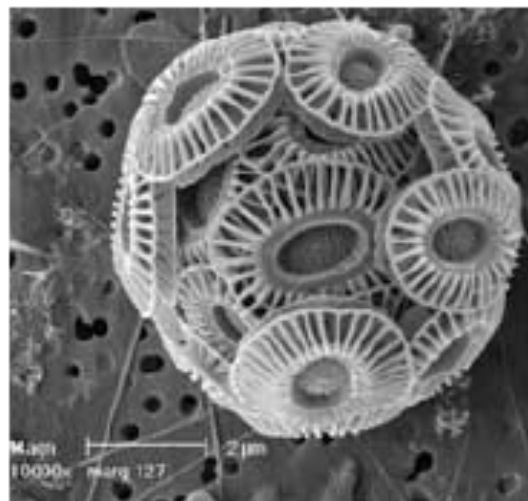


Calcium Uses

World production of CaO , Ca(OH)_2 , $\text{CaO} \cdot \text{MgO}$, $\text{Ca(OH)}_2 \cdot \text{MgO}$, and $\text{Ca(OH)}_2 \cdot \text{Mg(OH)}_2$ is $\sim 125,000$ Mt.

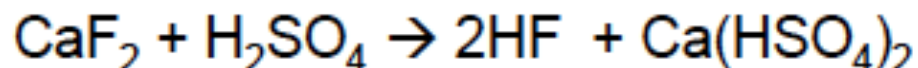


Hoover Dam



coccolithophore

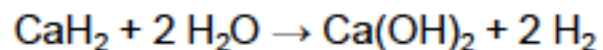
http://www.esa.int/esaCP/SEMDOG3AR2E_Protecting_1.html



Drying Agents and Desiccants

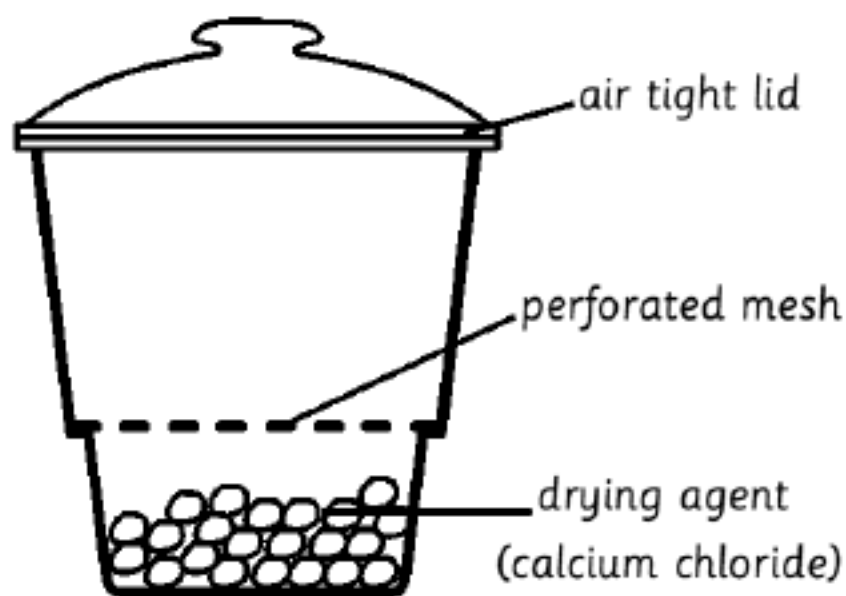
Drying agents for drying or predrying solvents include anhydrous MgSO_4 , CaCl_2 , CaSO_4 , Na_2SO_4 , K_2CO_3 , which are hygroscopic.

- some can be regenerated by heating
- some react irreversibly with H_2O (e.g. Ca , Mg , CaH_2)



Drying agents for use in desiccators include anhydrous CaSO_4 , CaCl_2 , KOH , P_2O_5 , which are hygroscopic.

The Desiccator



References

- Huheey et al., Inorganic Chemistry (book)
- Prakash et al., Advanced Inorganic Chemistry (book)
- Journal of Inorganic chemistry
- Journal of chemical education
- Download lecture materials:
- <http://nurma.staff.uns.ac.id>