# Group 2 / IIA; Alkaline Earth Metals Group

Basics

- Calcium (Ca) and magnsium (Mg) are ubiquitous; the rest is rarer; Radium is radioactive and thus only found in radioactive decay chains. Alltogether the earth alkali metals account for abount 4 % of the crust of the earth. Like the alkali metals they are very reactive and thus never found in the elemental state.
  - All are silvery-shining metals that oxidize immdiately in air. Stable oxide layers, however, protect some of beryllium (Be) and magnesium (Mg) so they can be used in their metallic state and are stable in water (which dissolves the others)
  - Magnesium (Mg), calcium (Ca) are technically important (not to mention the biological importance of calcium). The rest also finds special uses.
- *Table of Basic Data*

| **Name** ***(German)*** | **Beryllium** *Beryllium* | **Magnesium** *Magnesium* | **Calcium** *Calcium* | **Strontium** *Strontium* | **Barium** *Barium* | **Radium** *Radium* |
|---|---|---|---|---|---|---|
| **Atomic number** | 4 | 12 | 20 | 38 | 56 | 88 |
| **Atomic mass [u]** | 9,01 | 24,31 | 40,08 | 87,62 | 137,33 | 226,03 |
| **Melting point [K]** | 1551 | 921,95 | 1112 | 1042 | 998 | 973 |
| **Melting point [$^{o}$C]** | 1278 | 648,95 | 839 | 769 | 725 | 700 |
| **Melting point [$^{o}$F]** | 2332 | 1200 | 1542 | 1416 | 1337 | 1292 |
| **Boiling point [K]** | 3243 | 1380 | 1760 | 1657 | 1913 | 1413 |
| **Density [g/cm$^3$]** | 1,85 | 1,74 | 1,54 | 2,63 | 3,65 | 5,50 |
| **Ionization energy [eV]** | 9,32 | 7,65 | 6,11 | 5,70 | 5,21 | 5,28 |
| **Electro-negativitiy** | 1,5 | 1,2 | 1,0 | 1,0 | 1,0 | 1,0 |
| **Atomic radius [pm]** | 113,3 | 160 | 197,3 | 215,1 | 217,3 | 223 |
| **Ionic radius [pm]** | 34 | 78 | 106 | 127 | 143 | 152 |
| **Oxidation numbers** | 2 | 2 | 2 | 2 | 2 | 2 |
| **lattice typ Transformation temp. [$^{o}$C]** | hcp | hex | hcp<br>440<br>fcc | bcc<br>540<br>hcp<br>234<br>fcc | bcc | ? |
| **Lattice constant [Å] (a or c)** | 2,29 | 3,20 | 5,56<br>? | 6,09<br>? | 5,02 | ? |
| **Young's - Modulus [GPa]** | 310 | 44,3 | 19,6 | 15,7 | 12,7 | ? |

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|---|---|---|---|---|---|---|
| **Therm. expansion coefficient α [$10^{-6}K^{-1}$]** | 11,5 | 26 | 22 | ? | 19 | ? |

- In case of doubt all numbers are for room temperatures
- fcc = face centered cubic; lattice const. = a
  bcc = body centered cubic
  sc = simple cubic
  hp = simple hexagonal
  hcp = hexagonal close packed; lattice constants a and c.
  op = simple orthorhombic, monoclinic, triclinic
  tp = simple tetragonal
  dia = diamond structure
  r = trigonal or rhomboedral trigonal