

Conversion factors

Bayer Minerals

Alcor

The Aluminium Industry Insiders

1 kg of compound in first column corresponds with presented kg of compounds to the right

The number in italics represents the molar mass of the compound named in bold above that number

Boehmite $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (AluminaMonoHydrate / AMH)

& Diaspore

<i>119.98</i>	Boehmite	Al_2O_3	H_2O
Boehmite	1.00	0.85	0.15
Al_2O_3	1.18	1.00	0.18
H_2O	6.66	5.66	1.00

Limestone CaCO_3 (Calcium Carbonate)

$\text{CaCO}_3 + \text{O}_2 \rightarrow \text{CO}_2 + \text{CaO}$ [=quick lime]

$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$ [=slaked lime]

<i>100.09</i>	Limestone	CaO	CO_2	Ca(OH)_2
Limestone	1.00	0.56	0.44	0.74
CaO	1.78	1.00	0.78	1.32
CO_2	2.27	1.27	1.00	1.68
Ca(OH)_2	1.35	0.76	0.59	1.00

Sodium Oxalate $\text{Na}_2\text{C}_2\text{O}_4$ ('Oxalate')

4 C 'organic carbon' + $3\text{O}_2 + 2\text{Na}_2\text{O} \rightarrow 2\text{Na}_2\text{C}_2\text{O}_4$ $2\text{Na}_2\text{C}_2\text{O}_4 + \text{O}_2 + 2\text{Na}_2\text{O} \rightarrow 4\text{Na}_2\text{CO}_3$

<i>134.00</i>	Oxalate	C	Na_2O	Na_2CO_3
Oxalate	1.00	0.18	0.46	1.58
C	5.58	1.00	2.58	8.82
Na_2O	2.16	0.39	1.00	3.42
Na_2CO_3	0.63	0.11	0.29	1.00

Sodalite $3\text{Na}_2\text{O} \cdot 3\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot \text{Na}_2\text{CO}_3 \cdot 4\text{H}_2\text{O}$

DSP (De-Silication Product) formed in low temperature digestion due to Re- SiO_2 in Kaolinite

<i>1030.38</i>	Sodalite	Kaolinite	Na_2O	Al_2O_3	SiO_2	Na_2CO_3	H_2O
Sodalite	1.00	0.75	0.18	0.30	0.35	0.10	0.07
Kaolinite	1.33	1.00	0.24	0.39	0.47	0.14	0.09
Na_2O	5.54	4.17	1.00	1.65	1.94	0.57	0.39
Al_2O_3	3.37	2.53	0.61	1.00	1.18	0.35	0.24
SiO_2	2.86	2.15	0.52	0.85	1.00	0.29	0.20
Na_2CO_3	9.72	7.31	1.75	2.89	3.40	1.00	0.68
H_2O	14.30	10.75	2.58	4.24	5.00	1.47	1.00

Gibbsite $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ (AluminaTriHydrate / ATH)

<i>156.01</i>	Gibbsite	Al_2O_3	H_2O
Gibbsite	1.00	0.65	0.35
Al_2O_3	1.53	1.00	0.53
H_2O	2.89	1.89	1.00

Sodiumcarbonate Na_2CO_3 (Caustic soda)

$\text{Na}_2\text{CO}_3 + 2\text{H}_2\text{O} \rightarrow 2\text{Na}^+ + 2\text{OH}^- + \text{H}_2\text{CO}_3$

$\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{Na}^+ + 2\text{OH}^-$

<i>105.99</i>	Na_2CO_3	Na_2O	NaOH
Na_2CO_3	1.00	0.58	0.75
Na_2O	1.71	1.00	1.29
NaOH	1.32	0.77	1.00

Filter aid $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$ (TriCalciumAluminate / TCA)

<i>378.29</i>	Filter aid	CaO	Al_2O_3	H_2O
Filter aid	1.00	0.44	0.27	0.29
CaO	2.25	1.00	0.61	0.64
Al_2O_3	3.71	1.65	1.00	1.06
H_2O	3.50	1.56	0.94	1.00

Kaolinite $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$

<i>258.16</i>	Kaolinite	Al_2O_3	SiO_2	H_2O
Kaolinite	1.00	0.39	0.47	0.14
Al_2O_3	2.53	1.00	1.18	0.35
SiO_2	2.15	0.85	1.00	0.30
H_2O	7.17	2.83	3.34	1.00

NaOH consumption by DSP - Chemical soda loss (kg NaOH/t SGA)

1.00 kg SiO_2 consumes 0.85 kg Al_2O_3

1.00 kg SiO_2 consumes 0.52 kg Na_2O + 0.29 kg Na_2CO_3

or 0.67 kg NaOH + 0.22 kg NaOH

Soda/Silica factor = 0.89 kg NaOH/kg SiO_2 or 0.69 kg Na_2O / kg SiO_2

Chem. soda loss (kg NaOH/t SGA) = Na/Si factor x Bauxite factor x Re- SiO_2 % in bauxite/10

Chem. soda loss (kg NaOH/t SGA) = 0.89 x Bauxite factor x Re- SiO_2 % in bauxite/10

Bauxite factor = t bauxite/t SGA

Mass increase when Kaolinite forms Sodalite

Sodalite/Kaolinite factor = 1.33

1 kg Re- SiO_2 in bauxite is from 2.15 kg kaolinite, and forms 2.86 kg Sodalite

Residue mass increase from 1 kg Re- SiO_2 in bauxite 0.71 kg