

LAMPIRAN A
CONTOH PERHITUNGAN

Lampiran A. Contoh Perhitungan

A.1 Perhitungan Pembuatan *Aquaregia*

Diketahui:

Penggunaan Larutan HCl = 75%

Penggunaan Larutan HNO₃ = 25%

Volume Kebutuhan = 50 ml

Perhitungan

Volume Kebutuhan x Penggunaan HCl

$$\text{HCl} = 75\% \times 50 \text{ ml}$$

$$\text{HCl} = 37,5 \text{ ml}$$

$$\text{HNO}_3 = 25\% \times 50 \text{ ml}$$

$$\text{HNO}_3 = 12,5 \text{ ml}$$

A.2 Perhitungan %kadar hasil XRF

Diketahui

Mr MgO = 40 g/mol

Ar Mg = 24 g/mol

Ar O = 16 g/mol

Perhitungan penggunaan Kadar Mg di dalam MgO

$$\% \text{ Kadar Mg} = \frac{\text{Ar Mg}}{\text{Mr MgO}} \times 100\%$$

$$\% \text{ Kadar Mg} = \frac{24 \text{ g/mol}}{16 \text{ g/mol}} \times 100\%$$

$$\% \text{ Kadar Mg} = 60\%$$

Di dalam MgO tersusun atas 60% Mg dan 40% O

$$\text{MgO} = 77,6\%$$

$$\text{Mg} = 77,6\% \cdot 60\%$$

$$\text{Mg} = 46,8 \%$$

A.3 Perhitungan %kadar hasil Analisa ICP

Diketahui

$$\text{Volume awal} = 50 \text{ ml}$$

$$\text{Pengenceran} = 1000x$$

$$\text{Massa sampel} = 1,1 \text{ g}$$

$$1\% = 10000 \text{ ppm}$$

Contoh Perhitungan %kadar Ca:

$$\% \text{kadar Ca} = \frac{\text{Volume awal} \times \text{pengenceran} \times \text{hasil ICP}}{\text{Massa sampel} \times 10000}$$

$$\% \text{kadar Ca} = \frac{50 \times 1000 \times 3,49052}{1,1 \times 10000}$$

$$\% \text{kadar Ca} = 15,87\%$$

A.4 Perhitungan Nilai ΔG°

Diketahui

$$\Delta H^\circ \text{MgCO}_3 = 117.600$$

$$\Delta S^\circ \text{MgCO}_3 = -170$$

$$T \text{ (K)} = 273$$

Perhitungan

$$\Delta G^{\circ} = \Delta H^{\circ} - T \Delta S^{\circ}$$

$$\Delta G_{298}^{\circ} = 117.600 - ((298) - 170)$$

$$\Delta G_{298}^{\circ} = 71.190 \text{ J/Mol}$$

A.5 %Ekstraksi

Diketahui

$$C = 6 \text{ gram}$$

$$c = 46,8\%$$

$$F = 49,57 \text{ gram}$$

$$f = 7,73\%$$

Perhitungan

$$\% \text{Ekstraksi} = \frac{C \times c}{F \times f}$$

$$\% \text{Ekstraksi} = \frac{6 \text{ gram} \times 46,8\%}{49,57 \text{ gram} \times 7,73\%}$$

$$\% \text{Ekstraksi} = 74,2\%$$

LAMPIRAN B
DATA PENELITIAN

Lampiran B. Data Penelitian

B.1 Data XRF Awal Limbah *Brine Water*

Tabel B.1 Data XRF Awal Limbah *Brine Water*

Unsur	Kadar (%)	Unsur	Kadar (%)
Ca	30	K	0,14
Mg	7,63	Ba	0,105
Sr	5,8	S	0,0868
Na	5,03	Br	0,0154
Cl	2,25	Sn	0,0155
Si	1,63	Rb	0,0037
Zr	1,17	Cd	0,0013

Tabel B.2 Data XRF Sampel Filtrat Kalsinasi 700°C ; 2 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	77,6	P ₂ O ₅	2
Cl	6,2	SrO	1,6
CaO	5,7	SO ₃	1,4
SiO ₂	5,3	K ₂ O	0,2

Tabel B.3 Data XRF Sampel Filtrat Kalsinasi 750°C ; 2 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	73,4	P ₂ O ₅	1,9
SiO ₂	7,8	SO ₃	1,5
Cl	7	SrO	1,3
CaO	6,7	K ₂ O	0,2

Tabel B.4 Data XRF Sampel Filtrat Kalsinasi 750°C ; 4 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	73,2	P ₂ O ₅	1,7
CaO	10	SO ₃	1,6
SiO ₂	6,1	SrO	1,4
Cl	5,5	K ₂ O	0,5

Tabel B.5 Data XRF Sampel Filtrat Kalsinasi 650°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	61,2	SO ₃	3,1
Cl	18,9	SiO ₂	2,5
CaO	8,7	SrO	1,7
P ₂ O ₅	3,2	K ₂ O	0,8

Tabel B.6 Data XRF Sampel Filtrat Kalsinasi 675°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	64,9	SO ₃	2,8
Cl	12,2	P ₂ O ₅	2,1
CaO	11,9	K ₂ O	0,9
SrO	5	SiO ₂	n.d.

Tabel B.7 Data XRF Sampel Filtrat Kalsinasi 700°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	73,8	P ₂ O ₅	2
Cl	9,2	SO ₃	1,9
SiO ₂	6,6	SrO	1,1
CaO	4,9	K ₂ O	0,5

Tabel B.8 Data XRF Sampel Filtrat Kalsinasi 750°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
MgO	59,2	P ₂ O ₅	3,2
Cl	19,6	SrO	1,9
CaO	10,7	SiO ₂	1,3
SO ₃	3,2	K ₂ O	1,1

Tabel B.9 Data XRF Sampel Residu Kalsinasi 700°C ; 2 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	78,4	Cl	0,3
SrO	17,8	SO ₃	0,1
MgO	10,7	K ₂ O	0,1
Sc ₂ O ₃	0,5		

Tabel B.10 Data XRF Sampel Residu Kalsinasi 750°C ; 2 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	76,7	Cl	0,3
SrO	17,5	SO ₃	0,2
MgO	4,7	K ₂ O	0,1
Sc ₂ O ₃	0,5		

Tabel B.11 Data XRF Sampel Residu Kalsinasi 750°C ; 4 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	74,9	Cl	0,3
SrO	16,9	SO ₃	0,2
MgO	7,2	K ₂ O	0,1
Sc ₂ O ₃	0,4		

Tabel B.12 Data XRF Sampel Residu Kalsinasi 650°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	74,9	Cl	0,3
SrO	17,5	SO ₃	0,2
MgO	3,4	K ₂ O	0,2
Sc ₂ O ₃	0,4		

Tabel B.13 Data XRF Sampel Residu Kalsinasi 650°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	77,9	Cl	0,3
SrO	17,4	SO ₃	0,2
MgO	3,5	K ₂ O	0,1
Sc ₂ O ₃	0,4		

Tabel B.14 Data XRF Sampel Residu Kalsinasi 650°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	77,9	Cl	0,3
SrO	17,3	SO ₃	0,2
MgO	4	K ₂ O	0,1
Sc ₂ O ₃	0,5		

Tabel B.15 Data XRF Sampel Residu Kalsinasi 750°C ; 6 jam

Formula	Kadar (%)	Formula	Kadar (%)
CaO	77,9	Cl	0,4
SrO	16,8	SO ₃	0,2
MgO	8,6	K ₂ O	0,1
Sc ₂ O ₃	0,4		

Tabel B.16 Data ICP-OES Sampel Sebelum Kalsinasi

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Ca	3,49052	Cr	n.d
Na	1,29391	Mn	n.d.
Mg	0,982422	Cu	n.d
K	0,842056	Ni	n.d.
Al	0,554	Pb	n.d.
Ag	0,190631	Si	n.d.
Fe	n.d.	Sn	n.d.
B	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

Tabel B.17 Data ICP-OES Sampel Kalsinasi 700°C ; 2 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Na	2,81598	Ca	0,304118
Pb	1,21425.	B	0,118914
K	1,01589	Fe	n.d.
Mg	0,960045	Ni	n.d.
Al	0,5786795	Mn	n.d.
Ag	0,528321	Si	n.d.
Cu	0,471303	Sn	n.d.
Li	0,499709	Ti	n.d.
Cr	0,49499	Zn	n.d.

Tabel B.18 Data ICP-OES Sampel Kalsinasi 750°C ; 2 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Na	10,5444	B	n.d
K	2,04272	Mn	n.d.
Mg	0,664074	Cr	n.d.
Al	0,555085	Ni	n.d.
Ag	0,191257	Pb	n.d.
Ca	0,068854	Si	n.d.
Fe	n.d.	Sn	n.d.
Cu	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

Tabel B.19 Data ICP-OES Sampel Kalsinasi 750°C ; 4 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Ca	1,27138	B	n.d
Na	0,970478	Mn	n.d.
K	0,798433	Cr	n.d.
Mg	0,768273	Ni	n.d.
Al	0,534895	Pb	n.d.
Ag	0,206031	Si	n.d.
Fe	n.d.	Sn	n.d.
Cu	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

Tabel B.20 Data ICP-OES Sampel Kalsinasi 650°C ; 6 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Na	4,46367	Fe	n.d.
K	1,14505	Mn	n.d.
Ca	1,09647	Cr	n.d.
Mg	1,03995	Ni	n.d.
Al	0,556526	Pb	n.d.
Ag	0,515208	Si	n.d.
Li	0,504707	Sn	n.d.
Cu	0,441177	Ti	n.d.
B	0,156799	Zn	n.d.

Tabel B.21 Data ICP-OES Sampel Kalsinasi 6750°C ; 6 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
K	0,925141	B	n.d
Na	0,752062	Mn	n.d.
Mg	0,628903	Cr	n.d.
Al	0,501475	Ni	n.d.
Ca	0,345387	Pb	n.d.
Ag	0,196783	Si	n.d.
Fe	n.d.	Sn	n.d.
Cu	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

Tabel B.22 Data ICP-OES Sampel Kalsinasi 700°C ; 6 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Ca	1,07345	B	n.d
Na	0,734952	Mn	n.d.
Mg	0,683466	Cr	n.d.
K	0,656395	Ni	n.d.
Al	0,494702	Pb	n.d.
Ag	0,176636	Si	n.d.
Fe	n.d.	Sn	n.d.
Cu	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

Tabel B.23 Data ICP-OES Sampel Kalsinasi 750°C ; 6 jam

Unsur	Kadar (PPM)	Unsur	Kadar (PPM)
Na	2,03574	B	n.d
Ca	1,47053	Mn	n.d.
Mg	0,807103	Cr	n.d.
K	0,9395	Ni	n.d.
Ag	0,195922	Pb	n.d.
Al	0,522481	Si	n.d.
Fe	n.d.	Sn	n.d.
Cu	n.d	Ti	n.d.
Li	n.d.	Zn	n.d.

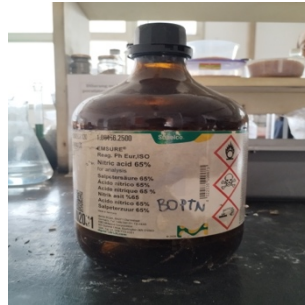
LAMPIRAN C

GAMBAR ALAT DAN BAHAN

Lampiran C. Gambar Alat dan Bahan



Gambar C.1 Asam Klorida



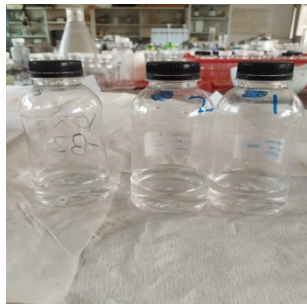
Gambar C.2 Asam Nitrat



Gambar C.3 *Aquadest*



Gambar C.4 Ayakan



Gambar C.5 Botol Plastik 100 ml



Gambar C.6 Batang Pengaduk



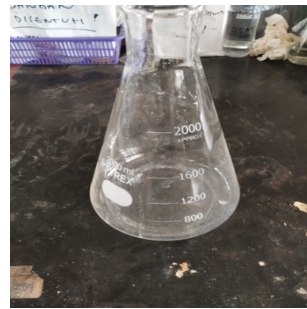
Gambar C.7 Bulp



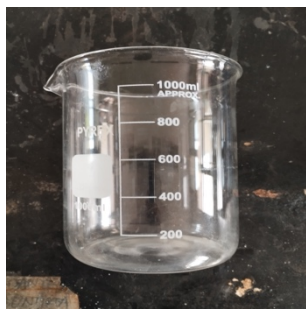
Gambar C.8 Cawan Porselin



Gambar C.9 Corong



Gambar C.10 Erlenmayer



Gambar C.11 Gelas Baker



Gambar C.12 Gelas Ukur



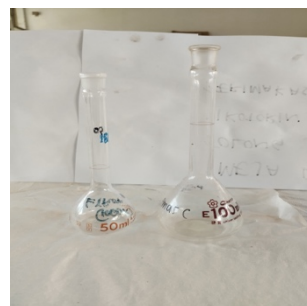
Gambar C.13 Hot Plate



Gambar C.14 Kaca Arloji



Gambar C.15 Kertas Saring



Gambar C.16 Labu Ukur



Gambar C.17 Limbah *Brine Water*



Gambar C.18 Mortar



Gambar C.19 *Muffel Furnace*



Gambar C.20 Neraca Digital



Gambar C.21 pH Meter



Gambar C.22 Pipet Tetes



Gambar C.23 Pipet Volume



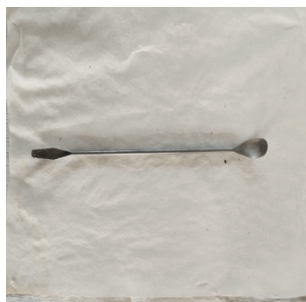
Gambar C.24 Sarung Tangan Latex



Gambar C.25 Sarung Tangan Tahan Panas



Gambar C.26 *Magnetic Bar*



Gambar C.27 Sapatula



Gambar C.28 Oven



Gambar C.29 Tang Penjepit



Gambar C.30 Termometer



Gambar C.31 Gas CO₂