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LAMPIRAN

A. Lampiran Alat

(a) (b) (c)

(a) *Analytical Balance*, (b) Tabung Ukur, (c) *Magnetic Stirrer*

(a) (b) (c)

(a) Wadah Keramik, (b) *Furnace*, (c) Corong kaca

(a) (b) (c)

(a) *Sieve* 200 mesh, (b) Gelas ukur, (c) Mortal

(a) (b)

(a) XRF, (b) XRD

(a)

(a) *Shore Hardness A*

B. Lampiran Bahan

(a) (b) (c)

(a) DCPA, (b) Cangkang kerang darah, (c) Bubuk cangkang kerang darah 200 mesh

(a) (b) (c)

(a) *Aluminium Foil*, (b) Tisu, (c) Kertas saring Whatman no. 42

(a) (b) (c)

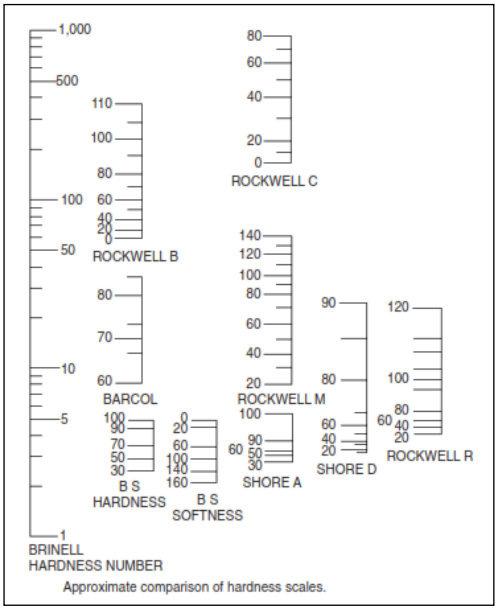
(a) Bubuk PMMA, (b) Monomer MMA, (c) Lem silikon

(a) (b) (c)

(a),DAP (b) *Master* cetakan gabus ukuran 2x2x1.5 cm , (c) PVA

C. Lampiran Analisis Data

1. Penurunan Rumus Kekerasan



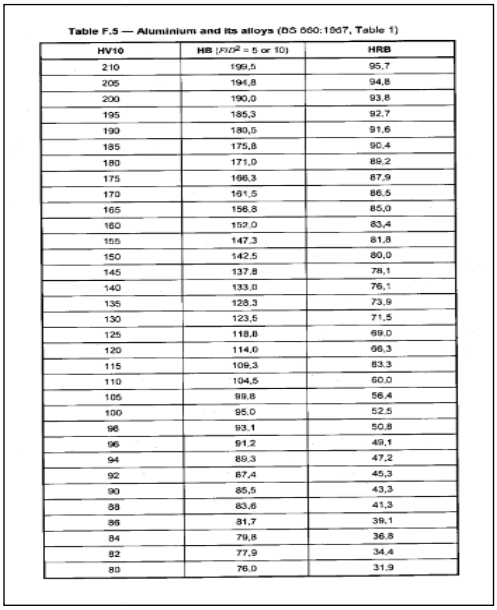


Table F.5 — Aluminium and its alloys (BS 660:1987, Table 1)

HV10	HB (F/D^2 = 5 or 10)	HRB
210	199,5	95,7
205	194,8	94,8
200	190,0	93,8
195	185,3	92,7
190	180,5	91,6
185	175,8	90,4
180	171,0	89,2
175	166,3	87,9
170	161,5	86,5
165	156,8	85,0
160	152,0	83,4
155	147,3	81,8
150	142,5	80,0
145	137,8	78,1
140	133,0	76,1
135	128,3	73,9
130	123,5	71,5
125	118,8	69,0
120	114,0	66,3
115	109,3	63,3
110	104,5	60,0
105	99,8	56,4
100	95,0	52,5
98	93,1	50,8
96	91,2	49,1
94	89,3	47,2
92	87,4	45,3
90	85,5	43,3
88	83,6	41,3
86	81,7	39,1
84	79,8	36,8
82	77,9	34,4
80	76,0	31,9

Perkiraan perbandingan skala kekerasan; (kiri) Shore A dan BHN[32], (kanan) HV10 [VHN] dan HB [BHN][33]

$$\frac{SHA-SHA_{batas\ bawah}}{SHA_{batas\ atas}-SHA_{batas\ bawah}} = \frac{BHN-BHN_{batas\ bawah}}{BHN_{batas\ bawah}-BHN_{batas\ bawah}}$$ [32]

$$\frac{SHA-30}{100-30} = \frac{BHN-2.5}{5.5-2.5} \quad \text{(C.1)}$$

$$\frac{SHA-30}{70} = \frac{BHN-2.5}{3} \quad \text{(C.2)}$$

$$3(SHA-30) = 70(BHN-2.5) \quad \text{(C.3)}$$

$$3\,SHA - 90 = 70\,BHN - 175 \quad \text{(C.4)}$$

$$3\,SHA - 90 + 175 = 70\,BHN \quad \text{(C.5)}$$

$$3\,SHA + 85 = 70\,BHN \quad \text{(C.6)}$$

$$\frac{3}{70}SHA + \frac{85}{70} = BHN \quad \text{(C.7)}$$

$$0.0429\,(SHA) + 1.2142 = BHN \quad \text{(C.8)}$$

$$VHN = 1.0526\,(BHN) \quad \text{(D.1)}$$

2. Susut Bakar CaO

$$\left(1 - \frac{massa\ setelah\ dibakar\ [g]}{massa\ sebelum\ dibakar\ [g]}\right) x100\%$$

Tabel C.1 Susut Bakar CaO

Sintesis CaO ke-	Massa sebelum dibakar (g)	Massa setelah dibakar (g)	Susut bakar CaO (%)	Rata-rata susut bakar CaO (%)
1	7.0217	5.0296	28.3706	30.1698
2	7.656	5.1224	33.0930	
3	7.0501	5.1686	26.6876	
4	7.0448	4.6593	33.8619	
5	7.046	4.904	30.4002	
6	7.0322	5.0819	27.7339	
7	7.0172	4.7167	32.7837	
8	7.057	4.999	29.1625	
9	7.01	4.9466	29.4351	

3. Efisiensi HAp

$$= \left(\frac{massa\ HAp\ [g]}{massa\ CaO_{(s)}\ [g] + massa\ (NH_4)_2HPO_{4(s)}[g]}\right) x100\%$$

$$= \left(\frac{massa\ HAp\ [g]}{2.83 + 3.97}\right) x100\%$$

$$= \left(\frac{massa\ HAp\ [g]}{6.8}\right) x100\%$$

Tabel C.2 Rata-rata efisiensi HAp

Sintesis HAp ke-	Massa hasil sintesis (g)	Rata-rata massa hasil sintesis (g)	Rata-rata efisiensi HAp (%)

1	2.277	2.9833	43.8723
2	3.0627		
3	2.7004		
4	2.9686		
5	3.0252		
6	3.2826		
7	3.1588		
8	2.9344		
9	2.9653		
10	2.8564		
11	3.3839		
12	3.1845		

4. Susut Bakar Biokeramik HAp-DCPA

$$= \left(1 - \frac{massa\ setelah\ dibakar\ [g]}{massa\ sebelum\ dibakar\ [g]}\right) x100\%$$

Tabel C.3 Rata-rata Susut Bakar Biokeramik HAp-DCPA

Kode Sampel	**Massa sebelum dibakar (g)**	**Massa setelah dibakar (g)**	**Susut bakar biokeramik (%)**	**Rata-rata susut bakar biokeramik (%)**
A1	3.6691	2.5086	31.6290	31.5398
A2	3.4614	2.4198	30.0919	
A3	3.6068	2.5172	30.2096	
A4	3.6829	2.4689	32.9632	
A5	3.7363	2.5106	32.8052	

5. XRF Sampel

```
SAMPLE ANALYSIS REPORT                                THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER                          UNIQUANT(TM) STANDARDLESS METHOD
_____________________________________________________________________________

C:\UQed\USER\Quant'X\Job\JOB.284    2020-08-12
bbk#KRG

Quant'X Rh end window 50kV
C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as :  Elements     Matrix (Shape & ImpFc) :  4|Ca..
X-ray path    =     Air       Film type     = No supporting film
Case number   =  0  All known
Eff.Diam.     = 13.0 mm       Eff.Area      = 132.7 mm2
KnownConc     =  0    %
Rest          =  0    %                     Viewed Mass   = 500.00 mg
Dil/Sample    =  0                          Sample Height = 5.00 mm

          El     m/m%     StdErr
          --     -------- -------
          Ca      97.61    0.19
          Si       1.34    0.13
          Sr       0.649   0.060
          Fe       0.331   0.092
          Nb       0.0266  0.0039

          Mo       0.0170  0.0035
          In       0.0089  0.0012
          Sb       0.0082  0.0016
          Sn       0.0069  0.0016
          Ru       0.0068  0.0028


KnownConc= 0                   REST= 0                  D/S= 0
Sum Conc's before normalisation to 100% :   40.9 %
```

XRF bubuk kerang darah 200 mesh

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

C:\UQed\USER\Quant'X\Job\JOB.596 2021-03-18
ido#800#5jAM

Quant'X Rh end window 50kV
C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as : Elements Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 500.00 mg
Dil/Sample = 0 Sample Height = 5.00 mm

El	m/m%	StdErr
Ca	98.36	0.20
Si	1.00	0.11
Sr	0.530	0.051
Ti	0.049	0.018
Nb	0.0209	0.0030
Mo	0.0156	0.0027
In	0.0079	0.0008
Sn	0.0066	0.0010
Sb	0.0055	0.0011
Ru	0.0053	0.0021
Te	0.0052	0.0023

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 46.3 %

XRF Unsur CaO 800°C 5 jam

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

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IDO#800#5JAM OKS

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C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 500.000 mg
Dil/Sample = 0 Sample Height = 3.77 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	65.82	0.24	Ca	47.06	0.17
P2O5	33.78	0.24	Px	14.74	0.10
SrO	0.229	0.023	Sr	0.194	0.020
Fe2O3	0.099	0.042	Fe	0.069	0.029
TiO2	0.049	0.014	Ti	0.0297	0.0082
Nb2O5	0.0062	0.0025	Nb	0.0043	0.0017

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 58.1 %
Total % stripped Oxygen: 37.888

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

C:\UQed\USER\Quant'X\Job\JOB.657 2021-06-08
ido#A1 oks

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Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 1000.000 mg
Dil/Sample = 0 Sample Height = 7.54 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	70.98	0.28	Ca	50.75	0.20
P2O5	27.93	0.22	Px	12.19	0.10
SiO2	0.68	0.30	Si	0.32	0.14
SrO	0.291	0.026	Sr	0.246	0.022
TiO2	0.054	0.012	Ti	0.0321	0.0073
ZnO	0.0196	0.0079	Zn	0.0157	0.0064
Nb2O5	0.0150	0.0023	Nb	0.0105	0.0016
MoO3	0.0102	0.0022	Mo	0.0068	0.0014

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 57.4 %
Total % stripped Oxygen: 36.415

XRF Biokeramik A1

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

C:\UQed\USER\Quant'X\Job\JOB.660 2021-06-08
ido#A2 oks

Quant'X Rh end window 50kV
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Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 1000.000 mg
Dil/Sample = 0 Sample Height = 7.54 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	74.26	0.29	Ca	53.09	0.21
P2O5	25.17	0.22	Px	10.98	0.09
SrO	0.248	0.029	Sr	0.210	0.025
ZnO	0.226	0.011	Zn	0.182	0.009
TiO2	0.044	0.013	Ti	0.0265	0.0075
Nb2O5	0.0200	0.0015	Nb	0.0140	0.0010
MoO3	0.0137	0.0016	Mo	0.0091	0.0011
RuO4	0.0060	0.0011	Ru	0.0046	0.0008

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 56.8 %
Total % stripped Oxygen: 35.463

XRF Biokeramik A2

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

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ido#A3# oks

Quant'X Rh end window 50kV
C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 1000.000 mg
Dil/Sample = 0 Sample Height = 7.54 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	68.93	0.28	Ca	49.29	0.20
P2O5	29.57	0.23	Px	12.90	0.10
SiO2	0.66	0.31	Si	0.31	0.14
ZnO	0.520	0.026	Zn	0.418	0.021
SrO	0.125	0.029	Sr	0.105	0.025
MnO	0.108	0.053	Mn	0.084	0.041
TiO2	0.031	0.013	Ti	0.0188	0.0076
Nb2O5	0.0176	0.0021	Nb	0.0123	0.0015
MoO3	0.0115	0.0027	Mo	0.0077	0.0018

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 60.5 %
Total % stripped Oxygen: 36.835

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

C:\UQed\USER\Quant'X\Job\JOB.662 2021-06-08
ido#A4 oks

Quant'X Rh end window 50kV
C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 1000.000 mg
Dil/Sample = 0 Sample Height = 7.54 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	59.62	3.08	Ca	42.63	2.20
P2O5	25.27	1.31	Px	11.03	0.57
MgO	14.21	3.68	Mg	8.57	2.22
MnO	0.127	0.045	Mn	0.099	0.035
SrO	0.118	0.025	Sr	0.100	0.021
ZnO	0.0259	0.0076	Zn	0.0208	0.0061
Nb2O5	0.0110	0.0019	Nb	0.0077	0.0013
MoO3	0.0076	0.0018	Mo	0.0051	0.0012

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 57.8 %
Total % stripped Oxygen: 37.251

SAMPLE ANALYSIS REPORT THERMO FISHER SCIENTIFIC
ARL QUANT'X EDXRF ANALYZER UNIQUANT(TM) STANDARDLESS METHOD

C:\UQed\USER\Quant'X\Job\JOB.663 2021-06-08
ido#a5 oks

Quant'X Rh end window 50kV
C:\UQed\USER\Quant'X\Appl\AnySampleAir.kap 2008-06-13
Calculated as : Oxides Matrix (Shape & ImpFc) : 4|Ca..
X-ray path = Air Film type = No supporting film
Case number = 0 All known
Eff.Diam. = 13.0 mm Eff.Area = 132.7 mm2
KnownConc = 0 %
Rest = 0 % Viewed Mass = 1000.000 mg
Dil/Sample = 0 Sample Height = 7.54 mm

Compound	m/m%	StdErr	El	m/m%	StdErr
CaO	72.56	0.39	Ca	51.88	0.28
P2O5	25.76	0.22	Px	11.24	0.09
SiO2	1.13	0.30	Si	0.53	0.14
ZnO	0.218	0.011	Zn	0.175	0.009
MnO	0.177	0.050	Mn	0.137	0.038
SrO	0.112	0.028	Sr	0.094	0.023
Nb2O5	0.0155	0.0022	Nb	0.0108	0.0015
MoO3	0.0118	0.0024	Mo	0.0079	0.0016

KnownConc= 0 REST= 0 D/S= 0
Sum Conc's before normalisation to 100% : 59.4 %
Total % stripped Oxygen: 35.912

6. Hasil Analisis Semi-Kuantitatif Data XRD

Tabel C.4 Puncak-puncak deteksi sampel A1, A3, dan A5

Kode Sampel	Hasil Deteksi	HAp	β-CPP
A1	31.888°	31.766°	-
	32.874°	32.897°	
	39.774°	39.791°	
	46.564°	46.694°	
	48.316°	48.586°	
A3	29.391°	-	29.575°
	31.757°	31.766°	-
	32.151°	32.897°	-
	39.774°	39.791°	-
	43.585°	-	43.429°
	51.076°	51.255°	-
	57.779°	-	57.987°
A5	29.76°	-	29.575°
	31.411°	31.766°	-
	32.549°	32.897°	-
	39.255°	39.791°	-
	42.924°	-	42.918°
	46.462°	46.381°	-
	47.353°	48.081°	-
	57.222°	-	57.297°

Berdasarkan referensi ICSD (*Inorganic Crystal Structure Database*) no. 01-074-0566 untuk HAp dan ICSD no.01-071-2123 untuk β-CPP.

7. Hasil Analisis Kuantitatif Data XRD

$$D = \frac{K\lambda}{\beta \cos\theta}$$

Tabel C.5 Nilai D HAp Ca/P 1.94

Kode Sampel	2θ (°)	θ (°)	θ (rad)	cos θ	β (°)	β (rad)	β*(cos θ)	K*λ	D (nm)	D rata-rata (nm)
HAp Ca/P 1.94	22.41	11.2050	0.1956	0.9809	0.3	0.0052	0.0051	0.1449	28.2116	33.0810
	23.495	11.7475	0.2050	0.9791	0.29	0.0051	0.0050	0.1449	29.2406	
	26.06	13.0300	0.2274	0.9743	0.32	0.0056	0.0054	0.1449	26.6299	
	26.494	13.2470	0.2312	0.9734	0.388	0.0068	0.0066	0.1449	21.9822	
	28.59	14.2950	0.2495	0.9690	0.5	0.0087	0.0085	0.1449	17.1349	
	29.49	14.7450	0.2573	0.9671	0.46	0.0080	0.0078	0.1449	18.6628	
	30.005	15.0025	0.2618	0.9659	0.17	0.0030	0.0029	0.1449	50.5596	
	31.32	15.6600	0.2733	0.9629	0.2	0.0035	0.0034	0.1449	43.1111	
	31.7	15.8500	0.2766	0.9620	0.2934	0.0051	0.0049	0.1449	29.4147	
	32.4216	16.2108	0.2829	0.9602	0.4767	0.0083	0.0080	0.1449	18.1370	
	32.82	16.4100	0.2864	0.9593	0.3886	0.0068	0.0065	0.1449	22.2715	
	33.5093	16.7547	0.2924	0.9575	0.4386	0.0077	0.0073	0.1449	19.7680	
	34.2	17.1000	0.2985	0.9558	0.34	0.0059	0.0057	0.1449	25.5475	
	34.725	17.3625	0.3030	0.9544	0.59	0.0103	0.0098	0.1449	14.7432	
	35.88	17.9400	0.3131	0.9514	0.2	0.0035	0.0033	0.1449	43.6322	
	36.23	18.1150	0.3162	0.9504	0.14	0.0024	0.0023	0.1449	62.3937	
	39.88	19.9400	0.3480	0.9401	0.44	0.0077	0.0072	0.1449	20.0718	
	40.3925	20.1963	0.3525	0.9385	0.425	0.0074	0.0070	0.1449	20.8142	

	42.48	21.2400	0.3707	0.9321	0.36	0.0063	0.0059	0.1449	24.7423	
	44.43	22.2150	0.3877	0.9258	0.26	0.0045	0.0042	0.1449	34.4916	
	45.96	22.9800	0.4011	0.9206	0.16	0.0028	0.0026	0.1449	56.3613	
	47.2983	23.6492	0.4128	0.9160	0.4233	0.0074	0.0068	0.1449	21.4111	
	47.88	23.9400	0.4178	0.9140	0.16	0.0028	0.0026	0.1449	56.7726	
	48.6925	24.3463	0.4249	0.9111	0.295	0.0051	0.0047	0.1449	30.8899	
	49.18	24.5900	0.4292	0.9093	0.16	0.0028	0.0025	0.1449	57.0637	
	50.0175	25.0088	0.4365	0.9062	0.375	0.0065	0.0059	0.1449	24.4295	
	51.11	25.5550	0.4460	0.9022	0.42	0.0073	0.0066	0.1449	21.9105	
	51.84	25.9200	0.4524	0.8994	0.36	0.0063	0.0057	0.1449	25.6409	
	52.6633	26.3317	0.4596	0.8962	0.2867	0.0050	0.0045	0.1449	32.3101	
	53.7	26.8500	0.4686	0.8922	0.36	0.0063	0.0056	0.1449	25.8482	
	54.95	27.4750	0.4795	0.8872	0.18	0.0031	0.0028	0.1449	51.9865	
	56.39	28.1950	0.4921	0.8813	0.26	0.0045	0.0040	0.1449	36.2303	
	57.66	28.8300	0.5032	0.8761	0.24	0.0042	0.0037	0.1449	39.4865	
	58.025	29.0125	0.5064	0.8745	0.17	0.0030	0.0026	0.1449	55.8439	
	58.74	29.3700	0.5126	0.8715	0.12	0.0021	0.0018	0.1449	79.3884	
	60.355	30.1775	0.5267	0.8645	0.51	0.0089	0.0077	0.1449	18.8308	
	61.02	30.5100	0.5325	0.8615	0.32	0.0056	0.0048	0.1449	30.1138	
	62.14	31.0700	0.5423	0.8565	0.48	0.0084	0.0072	0.1449	20.1931	
	63.5	31.7500	0.5541	0.8504	0.36	0.0063	0.0053	0.1449	27.1200	
	64.495	32.2475	0.5628	0.8458	0.51	0.0089	0.0075	0.1449	19.2477	
	65.5633	32.7817	0.5721	0.8407	0.3133	0.0055	0.0046	0.1449	31.5187	
	66.79	33.3950	0.5829	0.8349	0.18	0.0031	0.0026	0.1449	55.2441	

Tabel C.6 Nilai D sampel A1 (0% wt DCPA)

Kode Sampel	2θ (°)	θ (°)	θ (rad)	cos θ	β (°)	β (rad)	β*(cos θ)	K*λ	D (nm)	D rata-rata (nm)
A1 (0% wt DCPA)	21.84	10.9200	0.1906	0.9819	0.08	0.0014	0.0014	0.1449	105.6908	35.4760
	22.64	11.3200	0.1976	0.9805	0.12	0.0021	0.0021	0.1449	70.5573	
	23.185	11.5925	0.2023	0.9796	0.11	0.0019	0.0019	0.1449	77.0458	
	26.015	13.0075	0.2270	0.9743	0.85	0.0148	0.0145	0.1449	10.0245	
	28.01	14.0050	0.2444	0.9703	0.34	0.0059	0.0058	0.1449	25.1662	
	29.08	14.5400	0.2538	0.9680	0.96	0.0168	0.0162	0.1449	8.9342	
	32.1	16.0500	0.2801	0.9610	1.152	0.0201	0.0193	0.1449	7.4990	
	32.78	16.3900	0.2861	0.9594	1.2	0.0209	0.0201	0.1449	7.2115	
	34.36	17.1800	0.2998	0.9554	0.64	0.0112	0.0107	0.1449	13.5779	
	35.385	17.6925	0.3088	0.9527	0.19	0.0033	0.0032	0.1449	45.8649	
	37.36	18.6800	0.3260	0.9473	0.04	0.0007	0.0007	0.1449	219.0954	
	39.89	19.9450	0.3481	0.9400	0.78	0.0136	0.0128	0.1449	11.3229	
	42.02	21.0100	0.3667	0.9335	0.44	0.0077	0.0072	0.1449	20.2123	
	43.75	21.8750	0.3818	0.9280	0.34	0.0059	0.0055	0.1449	26.3127	
	46.81	23.4050	0.4085	0.9177	0.7	0.0122	0.0112	0.1449	12.9236	
	48.08	24.0400	0.4196	0.9133	0.32	0.0056	0.0051	0.1449	28.4083	
	49.5625	24.7813	0.4325	0.9079	0.615	0.0107	0.0097	0.1449	14.8686	
	50.52	25.2600	0.4409	0.9044	0.48	0.0084	0.0076	0.1449	19.1249	
	51.14	25.5700	0.4463	0.9021	0.56	0.0098	0.0088	0.1449	16.4349	
	51.985	25.9925	0.4537	0.8989	0.43	0.0075	0.0067	0.1449	21.4800	
	53.1833	26.5917	0.4641	0.8942	0.4067	0.0071	0.0063	0.1449	22.8283	
	55.9	27.9500	0.4878	0.8834	0.44	0.0077	0.0068	0.1449	21.3600	
	57.11	28.5550	0.4984	0.8784	0.3	0.0052	0.0046	0.1449	31.5063	

	59.93	29.9650	0.5230	0.8663	0.22	0.0038	0.0033	0.1449	43.5597	
	61.67	30.8350	0.5382	0.8586	0.22	0.0038	0.0033	0.1449	43.9495	
	63.005	31.5025	0.5498	0.8526	0.35	0.0061	0.0052	0.1449	27.8207	
	64.12	32.0600	0.5596	0.8475	0.56	0.0098	0.0083	0.1449	17.4931	
	65.06	32.5300	0.5678	0.8431	0.52	0.0091	0.0077	0.1449	18.9367	
	66.44	33.2200	0.5798	0.8366	0.24	0.0042	0.0035	0.1449	41.3500	
	69.69	34.8450	0.6082	0.8207	0.3	0.0052	0.0043	0.1449	33.7198	

Tabel C.7 Nilai D sampel A3 (25% wt DCPA)

Kode Sampel	2θ (°)	θ (°)	θ (rad)	cos θ	β (°)	β (rad)	β*(cos θ)	K*λ	D (nm)	D rata-rata (nm)
A3 (25% wt DCPA)	21.37	10.6850	0.1865	0.9827	0.06	0.0010	0.0010	0.1449	140.8108	70.0940
	21.69	10.8450	0.1893	0.9821	0.1	0.0017	0.0017	0.1449	84.5313	
	22.635	11.3175	0.1975	0.9806	0.17	0.0030	0.0029	0.1449	49.8047	
	22.98	11.4900	0.2005	0.9800	0.2	0.0035	0.0034	0.1449	42.3597	
	23.51	11.7550	0.2052	0.9790	0.1	0.0017	0.0017	0.1449	84.8000	
	24.4	12.2000	0.2129	0.9774	0.04	0.0007	0.0007	0.1449	212.3497	
	24.94	12.4700	0.2176	0.9764	0.16	0.0028	0.0027	0.1449	53.1422	
	25.7933	12.8967	0.2251	0.9748	0.5067	0.0088	0.0086	0.1449	16.8088	
	26.49	13.2450	0.2312	0.9734	0.26	0.0045	0.0044	0.1449	32.8040	
	28.24	14.1200	0.2464	0.9698	0.08	0.0014	0.0014	0.1449	107.0101	
	28.8	14.4000	0.2513	0.9686	0.48	0.0084	0.0081	0.1449	17.8572	
	29.4617	14.7309	0.2571	0.9671	0.27	0.0047	0.0046	0.1449	31.7938	
	29.9983	14.9992	0.2618	0.9659	0.4167	0.0073	0.0070	0.1449	20.6263	
	30.52	15.2600	0.2663	0.9647	0.12	0.0021	0.0020	0.1449	71.7132	

	31.7566	15.8783	0.2771	0.9618	0.4867	0.0085	0.0082	0.1449	17.7347	
	32.26	16.1300	0.2815	0.9606	0.4934	0.0086	0.0083	0.1449	17.5160	
	32.9	16.4500	0.2871	0.9591	0.33	0.0058	0.0055	0.1449	26.2318	
	33.55	16.7750	0.2928	0.9574	0.34	0.0059	0.0057	0.1449	25.5034	
	34.04	17.0200	0.2971	0.9562	0.36	0.0063	0.0060	0.1449	24.1178	
	34.57	17.2850	0.3017	0.9548	0.3	0.0052	0.0050	0.1449	28.9828	
	35.92	17.9600	0.3135	0.9513	0.04	0.0007	0.0007	0.1449	218.1857	
	36.64	18.3200	0.3197	0.9493	0.2	0.0035	0.0033	0.1449	43.7271	
	38.94	19.4700	0.3398	0.9428	0.12	0.0021	0.0020	0.1449	73.3809	
	39.52	19.7600	0.3449	0.9411	0.66	0.0115	0.0108	0.1449	13.3661	
	39.78	19.8900	0.3471	0.9403	0.48	0.0084	0.0079	0.1449	18.3934	
	40.33	20.1650	0.3519	0.9387	0.34	0.0059	0.0056	0.1449	26.0126	
	41.04	20.5200	0.3581	0.9365	0.04	0.0007	0.0007	0.1449	221.6155	
	41.38	20.6900	0.3611	0.9355	0.12	0.0021	0.0020	0.1449	73.9543	
	41.87	20.9350	0.3654	0.9340	0.14	0.0024	0.0023	0.1449	63.4925	
	42.21	21.1050	0.3684	0.9329	0.1	0.0017	0.0016	0.1449	88.9909	
	42.7	21.3500	0.3726	0.9314	0.04	0.0007	0.0007	0.1449	222.8471	
	43.19	21.5950	0.3769	0.9298	0.14	0.0024	0.0023	0.1449	63.7778	
	43.72	21.8600	0.3815	0.9281	0.44	0.0077	0.0071	0.1449	20.3304	
	44.42	22.2100	0.3876	0.9258	0.08	0.0014	0.0013	0.1449	112.0938	
	44.86	22.4300	0.3915	0.9243	0.04	0.0007	0.0006	0.1449	224.5413	
	46.77	23.3850	0.4081	0.9179	0.42	0.0073	0.0067	0.1449	21.5360	
	47.28	23.6400	0.4126	0.9161	0.42	0.0073	0.0067	0.1449	21.5778	
	48.595	24.2975	0.4241	0.9114	0.21	0.0037	0.0033	0.1449	43.3763	
	49.235	24.6175	0.4297	0.9091	0.43	0.0075	0.0068	0.1449	21.2377	
	50.025	25.0125	0.4366	0.9062	0.25	0.0044	0.0040	0.1449	36.6454	

50.51	25.2550	0.4408	0.9044	0.06	0.0010	0.0009	0.1449	152.9927	
51.085	25.5425	0.4458	0.9023	0.35	0.0061	0.0055	0.1449	26.2899	
51.86	25.9300	0.4526	0.8993	0.16	0.0028	0.0025	0.1449	57.6969	
52.6466	26.3233	0.4594	0.8963	0.1333	0.0023	0.0021	0.1449	69.4871	
53.2	26.6000	0.4643	0.8942	0.24	0.0042	0.0037	0.1449	38.6872	
53.7466	26.8733	0.4690	0.8920	0.1733	0.0030	0.0027	0.1449	53.7061	
56.41	28.2050	0.4923	0.8813	0.1	0.0017	0.0015	0.1449	94.2076	
57.17	28.5850	0.4989	0.8781	0.14	0.0024	0.0021	0.1449	67.5328	
57.71	28.8550	0.5036	0.8758	0.26	0.0045	0.0040	0.1449	36.4578	
58.23	29.1150	0.5082	0.8736	0.18	0.0031	0.0027	0.1449	52.7939	
58.7	29.3500	0.5123	0.8716	0.16	0.0028	0.0024	0.1449	59.5296	
60.205	30.1025	0.5254	0.8651	0.17	0.0030	0.0026	0.1449	56.4496	
60.46	30.2300	0.5276	0.8640	0.08	0.0014	0.0012	0.1449	120.1107	
61.28	30.6400	0.5348	0.8604	0.04	0.0007	0.0006	0.1449	241.2334	
62.22	31.1100	0.5430	0.8562	0.12	0.0021	0.0018	0.1449	80.8065	
63.065	31.5325	0.5503	0.8523	0.17	0.0030	0.0025	0.1449	57.2964	
63.43	31.7150	0.5535	0.8507	0.18	0.0031	0.0027	0.1449	54.2195	
64.03	32.0150	0.5588	0.8479	0.22	0.0038	0.0033	0.1449	44.5060	
64.53	32.2650	0.5631	0.8456	0.26	0.0045	0.0038	0.1449	37.7623	
64.9	32.4500	0.5664	0.8439	0.16	0.0028	0.0024	0.1449	61.4895	
65.265	32.6325	0.5695	0.8421	0.15	0.0026	0.0022	0.1449	65.7222	
65.545	32.7725	0.5720	0.8408	0.19	0.0033	0.0028	0.1449	51.9674	
66.71	33.3550	0.5822	0.8353	0.1	0.0017	0.0015	0.1449	99.3937	

Tabel C.8 Nilai D sampel A5 (50% wt DCPA)

Kode Sampel	2θ (°)	θ (°)	θ (rad)	cos θ	β (°)	β (rad)	β*(cos θ)	K*λ	D (nm)	D rata-rata (nm)
A5 (50% wt DCPA)	20.02	10.0100	0.1747	0.9848	0.08	0.0014	0.0014	0.1449	105.3812	70.8840
	21.29	10.6450	0.1858	0.9828	0.1	0.0017	0.0017	0.1449	84.4754	
	21.57	10.7850	0.1882	0.9823	0.1	0.0017	0.0017	0.1449	84.5144	
	21.9133	10.9567	0.1912	0.9818	0.0533	0.0009	0.0009	0.1449	158.6549	
	22.9133	11.4567	0.2000	0.9801	0.1867	0.0033	0.0032	0.1449	45.3719	
	25.6825	12.8413	0.2241	0.9750	0.2691	0.0047	0.0046	0.1449	31.6430	
	26.1833	13.0917	0.2285	0.9740	0.0867	0.0015	0.0015	0.1449	98.3125	
	26.52	13.2600	0.2314	0.9733	0.16	0.0028	0.0027	0.1449	53.3098	
	26.815	13.4075	0.2340	0.9727	0.07	0.0012	0.0012	0.1449	121.9253	
	27.72	13.8600	0.2419	0.9709	0.18	0.0031	0.0031	0.1449	47.5063	
	27.86	13.9300	0.2431	0.9706	0.26	0.0045	0.0044	0.1449	32.8989	
	28.58	14.2900	0.2494	0.9691	0.23	0.0040	0.0039	0.1449	37.2489	
	29.2454	14.6227	0.2552	0.9676	0.257	0.0045	0.0043	0.1449	33.3855	
	29.6	14.8000	0.2583	0.9668	0.12	0.0021	0.0020	0.1449	71.5587	
	30.24	15.1200	0.2639	0.9654	0.08	0.0014	0.0013	0.1449	107.4984	
	30.4725	15.2363	0.2659	0.9649	0.215	0.0038	0.0036	0.1449	40.0214	
	30.93	15.4650	0.2699	0.9638	0.18	0.0031	0.0030	0.1449	47.8558	
	31.5965	15.7983	0.2757	0.9622	0.243	0.0042	0.0041	0.1449	35.5065	
	31.995	15.9975	0.2792	0.9613	0.21	0.0037	0.0035	0.1449	41.1268	
	32.7035	16.3518	0.2854	0.9596	0.257	0.0045	0.0043	0.1449	33.6659	
	33.14	16.5700	0.2892	0.9585	0.04	0.0007	0.0007	0.1449	216.5467	

	33.315	16.6575	0.2907	0.9580	0.05	0.0009	0.0008	0.1449	173.3163	
	33.8945	16.9473	0.2958	0.9566	0.219	0.0038	0.0037	0.1449	39.6304	
	34.3	17.1500	0.2993	0.9555	0.16	0.0028	0.0027	0.1449	54.3030	
	34.5183	17.2592	0.3012	0.9550	0.1033	0.0018	0.0017	0.1449	84.1589	
	35.28	17.6400	0.3079	0.9530	0.14	0.0024	0.0023	0.1449	62.2271	
	35.799	17.8995	0.3124	0.9516	0.258	0.0045	0.0043	0.1449	33.8157	
	36.14	18.0700	0.3154	0.9507	0.08	0.0014	0.0013	0.1449	109.1610	
	38.045	19.0225	0.3320	0.9454	0.11	0.0019	0.0018	0.1449	79.8338	
	39.26	19.6300	0.3426	0.9419	0.36	0.0063	0.0059	0.1449	24.4846	
	39.63	19.8150	0.3458	0.9408	0.3	0.0052	0.0049	0.1449	29.4155	
	40.155	20.0775	0.3504	0.9392	0.07	0.0012	0.0011	0.1449	126.2762	
	40.73	20.3650	0.3554	0.9375	0.06	0.0010	0.0010	0.1449	147.5948	
	41.72	20.8600	0.3641	0.9345	0.18	0.0031	0.0029	0.1449	49.3584	
	41.9	20.9500	0.3656	0.9339	0.12	0.0021	0.0020	0.1449	74.0820	
	42.15	21.0750	0.3678	0.9331	0.06	0.0010	0.0010	0.1449	148.2882	
	42.84	21.4200	0.3738	0.9309	0.15	0.0026	0.0024	0.1449	59.4543	
	43.06	21.5300	0.3758	0.9302	0.22	0.0038	0.0036	0.1449	40.5677	
	43.24	21.6200	0.3773	0.9296	0.04	0.0007	0.0006	0.1449	223.2608	
	43.5725	21.7863	0.3802	0.9286	0.135	0.0024	0.0022	0.1449	66.2278	
	44.4366	22.2183	0.3878	0.9257	0.1133	0.0020	0.0018	0.1449	79.1530	
	46.4783	23.2392	0.4056	0.9189	0.3433	0.0060	0.0055	0.1449	26.3187	
	46.7933	23.3967	0.4083	0.9178	0.1733	0.0030	0.0028	0.1449	52.1981	
	47.02	23.5100	0.4103	0.9170	0.168	0.0029	0.0027	0.1449	53.8911	
	47.305	23.6525	0.4128	0.9160	0.33	0.0058	0.0053	0.1449	27.4653	
	47.8716	23.9358	0.4178	0.9140	0.1567	0.0027	0.0025	0.1449	57.9663	
	48.24	24.1200	0.4210	0.9127	0.22	0.0038	0.0035	0.1449	41.3470	

	48.42	24.2100	0.4225	0.9120	0.1734	0.0030	0.0028	0.1449	52.4957	
	48.725	24.3625	0.4252	0.9110	0.07	0.0012	0.0011	0.1449	130.1957	
	49.26	24.6300	0.4299	0.9090	0.36	0.0063	0.0057	0.1449	25.3697	
	50.18	25.0900	0.4379	0.9056	0.1866	0.0033	0.0029	0.1449	49.1272	
	50.44	25.2200	0.4402	0.9047	0.2	0.0035	0.0032	0.1449	45.8846	
	50.755	25.3775	0.4429	0.9035	0.13	0.0023	0.0020	0.1449	70.6835	
	50.99	25.4950	0.4450	0.9026	0.1	0.0017	0.0016	0.1449	91.9782	
	51.15	25.5750	0.4464	0.9020	0.18	0.0031	0.0028	0.1449	51.1331	
	51.685	25.8425	0.4510	0.9000	0.09	0.0016	0.0014	0.1449	102.4963	
	51.935	25.9675	0.4532	0.8990	0.19	0.0033	0.0030	0.1449	48.6023	
	52.7	26.3500	0.4599	0.8961	0.2	0.0035	0.0031	0.1449	46.3239	
	52.9533	26.4767	0.4621	0.8951	0.2933	0.0051	0.0046	0.1449	31.6227	
	53.18	26.5900	0.4641	0.8942	0.1466	0.0026	0.0023	0.1449	63.3296	
	55.68	27.8400	0.4859	0.8843	0.2	0.0035	0.0031	0.1449	46.9444	
	57.12	28.5600	0.4985	0.8783	0.16	0.0028	0.0025	0.1449	59.0772	
	57.32	28.6600	0.5002	0.8775	0.12	0.0021	0.0018	0.1449	78.8446	
	57.71	28.8550	0.5036	0.8758	0.14	0.0024	0.0021	0.1449	67.7074	
	59.79	29.8950	0.5218	0.8669	0.14	0.0024	0.0021	0.1449	68.4028	
	60.53	30.2650	0.5282	0.8637	0.26	0.0045	0.0039	0.1449	36.9703	
	61.335	30.6675	0.5352	0.8601	0.21	0.0037	0.0032	0.1449	45.9623	
	61.62	30.8100	0.5377	0.8589	0.12	0.0021	0.0018	0.1449	80.5531	
	62.16	31.0800	0.5424	0.8564	0.08	0.0014	0.0012	0.1449	121.1715	
	62.85	31.4250	0.5485	0.8533	0.26	0.0045	0.0039	0.1449	37.4200	
	63.205	31.6025	0.5516	0.8517	0.11	0.0019	0.0016	0.1449	88.6155	
	63.545	31.7725	0.5545	0.8501	0.11	0.0019	0.0016	0.1449	88.7779	
	63.86	31.9300	0.5573	0.8487	0.2	0.0035	0.0030	0.1449	48.9113	

	64.08	32.0400	0.5592	0.8477	0.1	0.0017	0.0015	0.1449	97.9400	
	64.54	32.2700	0.5632	0.8455	0.34	0.0059	0.0050	0.1449	28.8787	
	64.9233	32.4617	0.5666	0.8438	0.1667	0.0029	0.0025	0.1449	59.0257	
	65.24	32.6200	0.5693	0.8423	0.1	0.0017	0.0015	0.1449	98.5695	
	65.5233	32.7617	0.5718	0.8409	0.1267	0.0022	0.0019	0.1449	77.9211	
	66.245	33.1225	0.5781	0.8375	0.19	0.0033	0.0028	0.1449	52.1736	
	69.23	34.6150	0.6041	0.8230	0.14	0.0024	0.0020	0.1449	72.0559	
	69.56	34.7800	0.6070	0.8213	0.12	0.0021	0.0017	0.1449	84.2330	

Tabel C.9 Nilai D rata rata total

Σ D A1 (nm)	Σ D A3 (nm)	Σ D A5 (nm)	Σ D_{tot} (nm)	Σ puncak A1	Σ puncak A3	Σ puncak A5	Σ puncak total	D rata rata total (nm)
1064.2800	4415.9195	5741.6023	11221.8017	30	63	81	174	64.49311

8. Uji Kekerasan

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Website : www.globalquality.co.id
E-mail : calibration@globalquality.co.id

No. 060/MKS/GQI-P/05/2021
Page 1 of 1
Makassar, 24 Mei 2021

LAB TEST REPORT

Lab Enviromental Condition

Suhu Lingkungan	(24 ± 3) °C
Kelembapan Relatif	(65 ± 5) %

Tools Condition

Nama Alat	Buatan	Tipe	Serial	Kalibrasi Terakhir
Shore Durometer A	Precision Instrument	Analog	-	-

Testing Descriptions

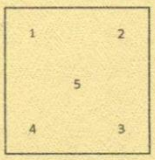
Jenis Pengujian	Uji Kekerasan
Metode Pengujian	Manual (*Handheld*)
Tempat Pengujian	Lab Kalibrasi Cab. Makassar
Tanggal Pengujian	19 Mei 2021
Waktu Pengujian	14:16 -14:20 WITA
Acuan Pengujian	ASTM D2240:00

Specimen Descriptions

Nama Spesimen	Biokeramik A1	
Dimensi Spesimen	Panjang	1 cm
	Lebar	1 cm
	Tinggi	1 cm
Karakteristik Spesimen	Biokeramik kubus terlindungi akrilik	

Test Results

Metode Perhitungan Pengujian : Rata-rata identasi
Besar Nilai Pengujian : **A/71.2/15**
Detail Pengujian



Pengujian ke-1 : **A/83/15**
Pengujian ke-2 : **A/67/15**
Pengujian ke-3 : **A/83/15**
Pengujian ke-4 : **A/52/15**
Pengujian ke-5 : **A/71/15**

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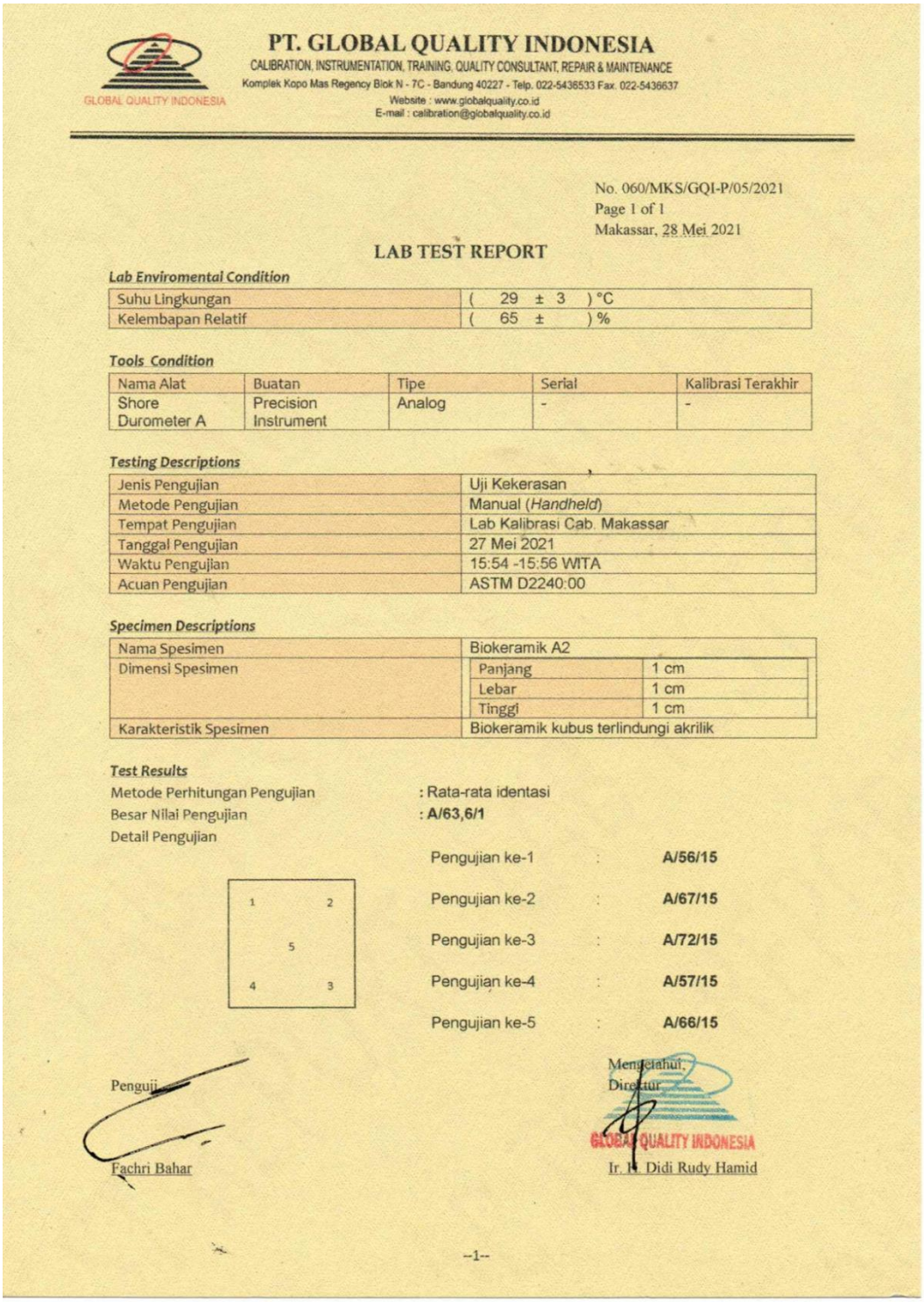
Biokeramik A1



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Makassar, 28 Mei 2021

LAB TEST REPORT

Lab Enviromental Condition

Suhu Lingkungan	(29 ± 3) °C
Kelembapan Relatif	(65 ±) %

Tools Condition

Nama Alat	Buatan	Tipe	Serial	Kalibrasi Terakhir
Shore Durometer A	Precision Instrument	Analog	-	-

Testing Descriptions

Jenis Pengujian	Uji Kekerasan
Metode Pengujian	Manual (*Handheld*)
Tempat Pengujian	Lab Kalibrasi Cab. Makassar
Tanggal Pengujian	27 Mei 2021
Waktu Pengujian	15:54 -15:56 WITA
Acuan Pengujian	ASTM D2240:00

Specimen Descriptions

Nama Spesimen	Biokeramik A2	
Dimensi Spesimen	Panjang	1 cm
	Lebar	1 cm
	Tinggi	1 cm
Karakteristik Spesimen	Biokeramik kubus terlindungi akrilik	

Test Results

Metode Perhitungan Pengujian : Rata-rata identasi

Besar Nilai Pengujian : **A/63,6/1**

Detail Pengujian

Pengujian ke-1 : **A/56/15**

Pengujian ke-2 : **A/67/15**

Pengujian ke-3 : **A/72/15**

Pengujian ke-4 : **A/57/15**

Pengujian ke-5 : **A/66/15**

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Biokeramik A2

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Website : www.globalquality.co.id
E-mail : calibration@globalquality.co.id

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Makassar, 28 Mei 2021

LAB TEST REPORT

Lab Enviromental Condition

Suhu Lingkungan	(29 ± 3) °C
Kelembapan Relatif	(65 ± 2) %

Tools Condition

Nama Alat	Buatan	Tipe	Serial	Kalibrasi Terakhir
Shore Durometer A	Precision Instrument	Analog	-	-

Testing Descriptions

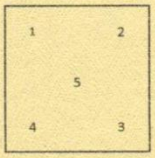
Jenis Pengujian	Uji Kekerasan
Metode Pengujian	Manual (*Handheld*)
Tempat Pengujian	Lab Kalibrasi Cab. Makassar
Tanggal Pengujian	27 Mei 2021
Waktu Pengujian	15:59 -16:01 WITA
Acuan Pengujian	ASTM D2240:00

Specimen Descriptions

Nama Spesimen	Biokeramik A3	
Dimensi Spesimen	Panjang	1 cm
	Lebar	1 cm
	Tinggi	1 cm
Karakteristik Spesimen	Biokeramik kubus terlindungi akrilik	

Test Results

MetodePerhitunganPengujian : Rata-rata identasi
Besar Nilai Pengujian : **A/62/1**
Detail Pengujian



Pengujian ke-1 : **A/83/15**
Pengujian ke-2 : **A/83/15**
Pengujian ke-3 : **A/36/15**
Pengujian ke-4 : **A/38/15**
Pengujian ke-5 : **A/70/15**

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Biokeramik A3

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Website : www.globalquality.co.id
E-mail : calibration@globalquality.co.id

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Page 1 of 1
Makassar, 03 Juni 2021

LAB TEST REPORT

Lab Enviromental Condition

Suhu Lingkungan	(28 ± 2) °C
Kelembapan Relatif	(60 ± 2) %

Tools Condition

Nama Alat	Buatan	Tipe	Serial	Kalibrasi Terakhir
Shore Durometer A	Precision Instrument	Analog	-	-

Testing Descriptions

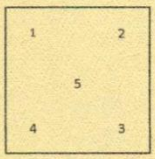
Jenis Pengujian	Uji Kekerasan
Metode Pengujian	Manual (*Handheld*)
Tempat Pengujian	Lab Kalibrasi Cab. Makassar
Tanggal Pengujian	31 Mei 2021
Waktu Pengujian	15:21 -15:24 WITA
Acuan Pengujian	ASTM D2240:00

Specimen Descriptions

Nama Spesimen	Biokeramik A4	
Dimensi Spesimen	Panjang	1 cm
	Lebar	1 cm
	Tinggi	1 cm
Karakteristik Spesimen	Biokeramik kubus terlindungi akrilik	

Test Results

Metode Perhitungan Pengujian : Rata-rata identasi
Besar Nilai Pengujian : **A/59,8/15**
Detail Pengujian



Pengujian ke-1 : **A/73/15**
Pengujian ke-2 : **A/55/15**
Pengujian ke-3 : **A/53/15**
Pengujian ke-4 : **A/52/15**
Pengujian ke-5 : **A/66/15**

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Biokeramik A4

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Website : www.globalquality.co.id
E-mail : calibration@globalquality.co.id

No. 060/MKS/GQI-P/05/2021
Page 1 of 1
Makassar, 24 Mei2021

LAB TEST REPORT

Lab Enviromental Condition

Suhu Lingkungan	(24 ± 3) °C
Kelembapan Relatif	(65 ± 5) %

Tools Condition

Nama Alat	Buatan	Tipe	Serial	Kalibrasi Terakhir
Shore Durometer A	Precision Instrument	Analog	-	-

Testing Descriptions

Jenis Pengujian	Uji Kekerasan
Metode Pengujian	Manual (*Handheld*)
Tempat Pengujian	Lab Kalibrasi Cab. Makassar
Tanggal Pengujian	19 Mei 2021
Waktu Pengujian	14:30 -14:35 WITA
Acuan Pengujian	ASTM D2240:00

Specimen Descriptions

Nama Spesimen	Biokeramik A5	
Dimensi Spesimen	Panjang	1 cm
	Lebar	1 cm
	Tinggi	1 cm
Karakteristik Spesimen	Biokeramik kubus terlindungi akrilik	

Test Results

Metode Perhitungan Pengujian : Rata-rata identasi
Besar Nilai Pengujian : **A/47,2/1**
Detail Pengujian

Pengujian ke-1 : **A/51/15**
Pengujian ke-2 : **A/41/15**
Pengujian ke-3 : **A/50/15**
Pengujian ke-4 : **A/42/15**
Pengujian ke-5 : **A/52/15**

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Biokeramik A5

9. Harga Kekerasan

$$BHN = 0.0429(SHA) + 1.2142$$

$$VHN = 1.0526(BHN)$$

Tabel C.10 Harga kekerasan shore hardness A

shore hardness A	identasi ke (n)	Sampel				
		A1	A2	A3	A4	A5
	1	83	56	83	73	51
	2	67	67	83	55	41
	3	83	72	36	53	50
	4	52	57	38	52	42
	5	71	66	70	66	52
	Rata-rata	71.2000	63.6000	62.0000	59.8000	47.2000
	standar deviasi (s)	12.8919	6.8775	23.4414	9.2574	5.2631
	Rata-rata total	60.7600				
	√n	2.2361				
	s/√n	5.7654	3.0757	10.4833	4.1400	2.3537
	t*(s/√n)	16.0071	8.5394	29.1059	11.4944	6.5349
	(t*(s/√n))^2	256.2271	72.9214	847.1528	132.1219	42.7045
	Σ(t*(s/√n))^2)	1351.1278				
	√Σ(t*(s/√n))^2)	36.7577				
	selang kepercayaan	71.2 ± 16.0071	63.6 ± 8.5394	62 ± 29.1059	59.8 ± 11.4944	47.2 ± 6.5349
	selang kepercayaan rata-rata	60.76 ± 36.7577				

Tabel C.11 Harga kekerasan brinell (kg/mm^2)

brinell (kg/mm^2)	identasi ke (n)	Sampel				
		A1	A2	A3	A4	A5
	1	4.7749	3.6166	4.7749	4.3459	3.4021
	2	4.0885	4.0885	4.7749	3.5737	2.9731
	3	4.7749	4.303	2.7586	3.4879	3.3592
	4	3.445	3.6595	2.8444	3.445	3.016
	5	4.2601	4.0456	4.2172	4.0456	3.445
	Rata-rata	4.2687	3.9426	3.8740	3.7796	3.2391
	standar deviasi (s)	0.5531	0.2950	1.0056	0.3971	0.2258
	Rata-rata total	3.8208				
	√n	2.2361				
	s/√n	0.2473	0.1319	0.4497	0.1776	0.1010
	t*(s/√n)	0.6867	0.3663	1.2486	0.4931	0.2803

	(t*(s/√n))^2	0.4716	0.1342	1.5591	0.2432	0.0786
	Σ(t*(s/√n))^2)	2.4866				
	√Σ(t*(s/√n))^2)	1.5769				
	selang kepercayaan	4.2687 ± 0.6867	3.9426 ± 0.3663	3.874 ± 1.2486	3.7796 ± 0.4931	3.2391 ± 0.2803
	selang kepercayaan rata-rata	3.8208 ± 1.5769				

Tabel C.12 Harga kekerasan vickers (kg/mm^2)

vickers (kg/mm^2)	identasi ke (n)	Sampel				
		A1	**A2**	**A3**	**A4**	**A5**
	1	5.0261	3.8068	5.0261	4.5745	3.5811
	2	4.3036	4.3036	5.0261	3.7617	3.1295
	3	5.0261	4.5293	2.9037	3.6714	3.5359
	4	3.6262	3.8520	2.9940	3.6262	3.1746
	5	4.4842	4.2584	4.4390	4.2584	3.6262
	Rata-rata	4.4932	4.1500	4.0778	3.9784	3.4095
	standar deviasi (s)	0.5822	0.3106	1.0585	0.4180	0.2377
	Rata-rata total	4.0218				
	√n	2.2361				
	s/√n	0.2603	0.1389	0.4734	0.1870	0.1063
	t*(s/√n)	0.7228	0.3856	1.3143	0.5190	0.2951
	(t*(s/√n))^2	0.5225	0.1487	1.7274	0.2694	0.0871
	Σ(t*(s/√n))^2)	2.7551				
	√Σ(t*(s/√n))^2)	1.6599				
	selang kepercayaan	4.4932 ± 0.7228	4.15 ± 0.3856	4.0778 ± 1.3143	3.9784 ± 0.519	3.4095 ± 0.2951
	selang kepercayaan rata-rata	4.0218 ± 1.6599				

Menggunakan kepercayaan 95% dengan nilai t-student= 2.7764, df/υ=4.

10. Perbandingan XRF Bubuk Kerang Darah-CaO-HAp-Biokeramik A1-A5

Komposisi kimia bubuk kerang darah

Unsur	Ca	Si	Sr	Fe	Nb	Dll (Mo, In, Sb, Sn, Ru)
Persentase (%)	97.61	1.34	0.65	0.33	0.03	0.02

Komposisi kimia bubuk kerang darah hasil sintering

Unsur	Ca	Si	Sr	Ti	Nb	Dll (Mo, In, Sb, Sn, Ru)
Persentase (%)	98.36	1.00	0.53	0.049	0.0209	0.0461

Komposisi Kimia Hidroksiapatit

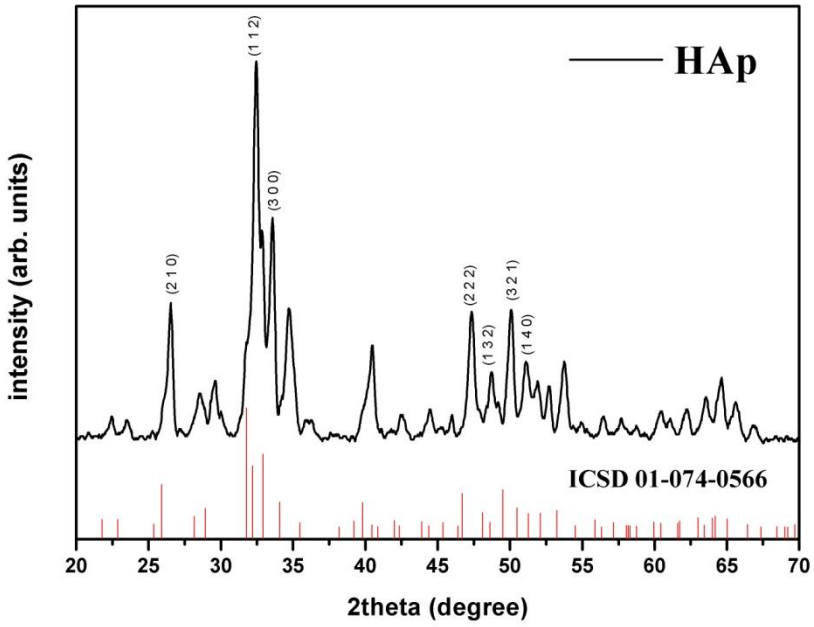
Oksida	CaO	P_2O_5	SrO	Fe_2O_3	TiO_2	Nb_2O_5	CaO/ P_2O_5
Persentase (%)	65.82	33.78	0.229	0.099	0.049	0.062	1.94

Komposisi Kimia Biokeramik HAp-DCPA

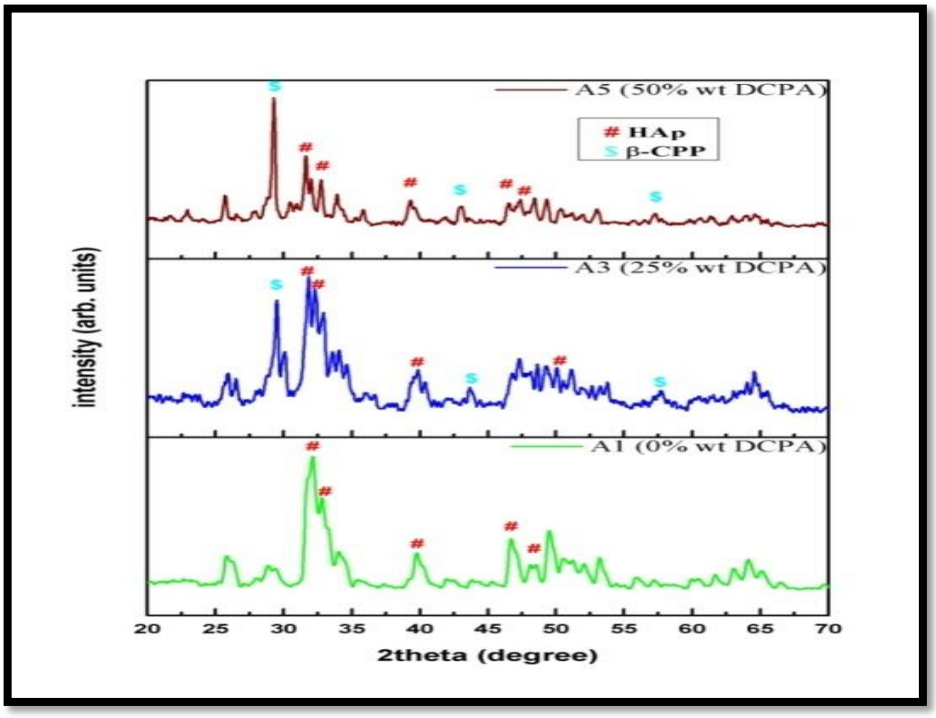
Oksida	**Persentase (%)**				
	A1	**A2**	**A3**	**A4**	**A5**
CaO	70.98	74.26	68.93	59.62	72.56
P_2O_5	27.93	25.17	29.57	25.27	25.76
SiO_2	0.68	-	0.66	-	1.13
SrO	0.291	0.248	0.125	0.118	0.112
TiO_2	0.054	0.044	0.031	-	-
ZnO	0.0196	0.226	0.52	0.0259	0.218
Nb_2O_5	0.015	0.02	0.0176	0.011	0.0155
MoO_3	0.0102	0.0137	0.0115	0.0076	0.0118

RuO_4	-	0.006	-	-	-

11. Perbandingan XRD HAp-Biokeramik A1, A3, A5



Grafik XRD Hidroksiapatit



Grafik XRD Sampel A1, A3, A5

D. Lampiran Dokumentasi Pengerjaan

Lokasi Pengambilan Sampel (5°07'16.1"S 119°23'45.3"E)

Pengeringan, penumbukan dan pengayakan kerang darah

Pembuatan mold dari lem silikon

Sintering bubuk kerang darah

Penimbangan CaO dan DAP

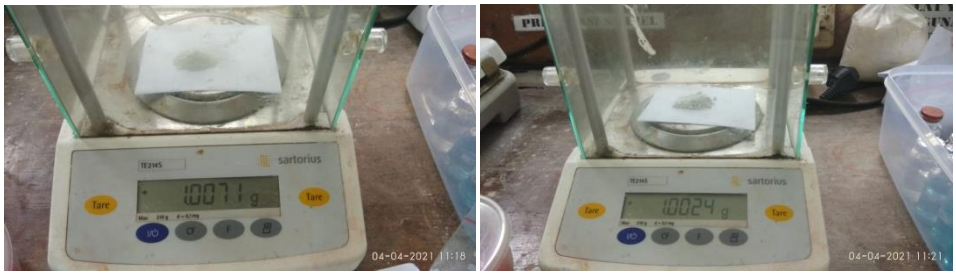
Pelarutan CaO dan DAP

Titrasi dan pengendapan selama semalaman (18 jam)

Penyaringan endapan menggunakan kertas saring

Pengeringan endapan

HAp yang telah melalui proses sintering

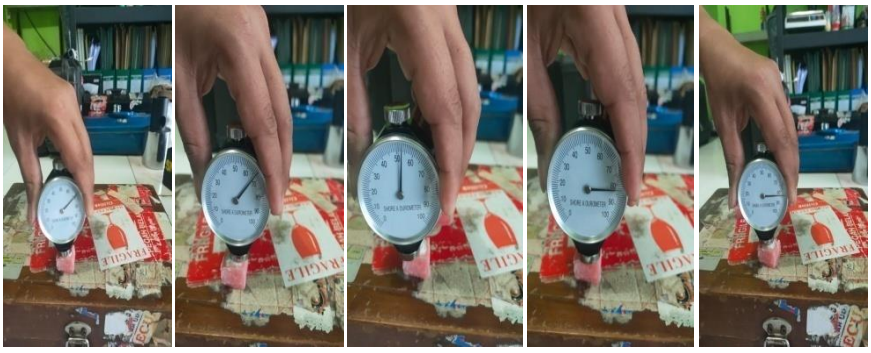


Penimbangan masing-masing HAp dan DCPA

Pembentukan biokeramik HAp-DCPA menggunakan PVA 5%

Biokeramik yang telah melalui proses pengeringan

Pelapisan biokeramik menggunakan resin akrilik



Uji kekerasan menggunakan shore hardness A