

Supplementary Data

This supplementary data is a part of paper entitled "Determination of Urea Controlled Released Composite Material Radius".

Determination urea controlled released material radius was conducted according to Lukman et.al. [24]. The picture of some materials together with a standard (In this research used watch battery) that has known radius were taken. After that, the radius of materials were determined by comparing the radius of material with that known standard by using method that has been reported in [24]. The material code in the respectively table below represents of each material grains of respectively kind of material in the picture.

Radius of un-swollen material



No	Material Code	Measurement	Value	Nominal Val.	Pass / Fail	Radius (mm)
1	Standard	Radius	54.25	54.25	Pass	3.9
2	BC2	Radius	12.5	12.5	Pass	0.8986175
3	BC3	Radius	10.5	10.5	Pass	0.7548387
4	BC4	Radius	12	12	Pass	0.8626728
5	BC5	Radius	14	14	Pass	1.0064516
6	BC6	Radius	11.5	11.5	Pass	0.8267281
7	BC7	Radius	8.5	8.5	Pass	0.6110599
8	BC8	Radius	7.75	7.75	Pass	0.5571429
9	BC9	Radius	10.75	10.75	Pass	0.7728111

Mean of
radius **0.79 mm**

Radius of swollen material without tapioca



No	Material code	Measurement	Value	Nominal Val.	Pass / Fail	Radius (mm)
1	standard	Radius	45.5	45.5	Pass	3.9
2	BC2	Radius	28	28	Pass	2.4
3	BC3	Radius	26.75	26.75	Pass	2.292857143
4	BC4	Radius	26.25	26.25	Pass	2.25
6	BC6	Radius	26	26	Pass	2.228571429
8	BC8	Radius	25.5	25.5	Pass	2.185714286
12	BC12	Radius	26	26	Pass	2.228571429
13	BC13	Radius	23.5	23.5	Pass	2.014285714
15	BC15	Radius	27	27	Pass	2.314285714
16	BC16	Radius	21.75	21.75	Pass	1.864285714
20	BC20	Radius	23.5	23.5	Pass	2.014285714
21	BC21	Radius	29.75	29.75	Pass	2.55
22	BC22	Radius	24.5	24.5	Pass	2.1
23	BC23	Radius	29.75	29.75	Pass	2.55
25	BC25	Radius	23.75	23.75	Pass	2.035714286
26	BC26	Radius	27	27	Pass	2.314285714
27	BC27	Radius	27	27	Pass	2.314285714
29	BC29	Radius	19.5	19.5	Pass	1.671428571
30	BC30	Radius	24.5	24.5	Pass	2.1
31	BC31	Radius	21	21	Pass	1.8
33	BC33	Radius	23.5	23.5	Pass	2.014285714
					Mean of radius	2.16 mm

Radius of swollen material with tapioca



No	Material Code	Area	Length	Radius	Radius (mm)
1	Standard	14741.14	430.3982	68.75	3.9
2	BC2	5944.679	273.3186	43.5	2.467636364
3	BC3	4901.67	248.1858	39.75	2.254909091
4	BC4	6082.123	276.4602	44.25	2.510181818
5	BC5	6361.725	282.7433	45	2.552727273
6	BC6	7389.811	304.7345	48.25	2.737090909
7	BC7	4417.865	235.6194	37.5	2.127272727
8	BC8	5281.017	257.6106	41.25	2.34
9	BC9	5281.017	257.6106	41	2.325818182
10	BC10	7853.982	314.1593	50	2.836363636
11	BC11	6082.123	276.4602	44	2.496
12	BC12	4071.504	226.1947	36	2.042181818
13	BC13	5410.608	260.7522	41.75	2.368363636
14	BC14	4536.46	238.761	37.75	2.141454545
15	BC15	6792.909	292.1681	46.5	2.637818182
16	BC16	7238.229	301.5929	47.75	2.708727273
17	BC17	5674.502	267.0354	42.5	2.410909091
18	BC19	4185.387	229.3363	36.5	2.070545455
19	BC20	4656.626	241.9026	38.5	2.184
20	BC21	4656.626	241.9026	38.75	2.198181818

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21	BC22	5808.805	270.177	43	2.439272727
22	BC23	7088.218	298.4513	47.5	2.694545455
23	BC24	6647.61	289.0265	46	2.609454545
24	BC25	4901.67	248.1858	39.5	2.240727273
25	BC26	6082.123	276.4602	44	2.496
26	BC27	5026.548	251.3274	40	2.269090909
27	BC28	8824.734	333.0088	53	3.006545455
28	BC29	4300.84	232.4779	37	2.098909091
29	BC30	3421.194	207.3451	33	1.872
30	BC31	4300.84	232.4779	37	2.098909091
31	BC32	4536.46	238.761	38	2.155636364
32	BC33	4071.504	226.1947	36	2.042181818
33	BC34	5026.548	251.3274	40	2.269090909
34	BC35	4417.865	235.6194	37.25	2.113090909
35	BC36	4071.504	226.1947	36	2.042181818
36	BC37	3848.451	219.9115	34.75	1.971272727
37	BC38	4901.67	248.1858	39.5	2.240727273
38	BC39	3421.194	207.3451	33	1.872
39	BC40	2922.467	191.6372	30.75	1.744363636
40	BC41	5152.997	254.469	40.25	2.283272727
41	BC42	3959.192	223.0531	35.5	2.013818182
42	BC43	1885.741	153.938	24.25	1.375636364
43	BC44	2922.467	191.6372	30.5	1.730181818
44	BC45	3421.194	207.3451	33	1.872
45	BC46	3019.071	194.7787	31.25	1.772727273
46	BC47	3421.194	207.3451	33	1.872
47	BC48	3525.652	210.4867	33.25	1.886181818
48	BC49	3525.652	210.4867	33.5	1.900363636
49	BC50	3959.192	223.0531	35.5	2.013818182
50	BC51	5541.769	263.8938	41.75	2.368363636
51	BC52	5410.608	260.7522	41.25	2.34
52	BC53	4536.46	238.761	38	2.155636364
53	BC54	4300.84	232.4779	37.25	2.113090909
54	BC55	4300.84	232.4779	37.25	2.113090909
55	BC56	5281.017	257.6106	41	2.325818182
56	BC57	4300.84	232.4779	36.75	2.084727273
57	BC58	6792.909	292.1681	46.5	2.637818182

Mean of
radius **2.22 mm**