

## Supplementary document

The raw data for each parameter are as follows:

### Batch test formula

The adsorption capacity was calculate using the following formula:

$$\text{Adsorption capacity (g/g)} = (S_t - S_o) / S_o$$

The percentage of oil removal will be determined as follows:

$$\text{Oil removal (\%)} = \frac{(m_{oil})}{(m_{oil,o})} 100$$

Where  $m_{oil}$  and  $m_{oil,o}$  are the amount of palm oil extracted from sago hampas (g) and initial amount of palm oil (g) respectively.  $S_t$  is the total mass of absorb sample and  $S_o$  is the initial weight of sample.

### Effect of sorption time

Adsorption capacity (g/g) data

Time (mins)	Mass of sago hampas before adsorption (g)	Mass of sago hampas after adsorption (g)			Adsorption capacity (g/g)			Average (g/g)
		Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
2	0.2	1.752	1.821	1.762	7.760	8.105	7.810	7.892
5	0.2	1.787	1.829	1.906	7.935	8.145	8.530	8.203
10	0.2	1.871	1.943	1.844	8.355	8.715	8.220	8.430
15	0.2	2.013	2.045	2.007	9.065	9.225	9.035	9.108
30	0.2	2.472	2.331	2.494	11.360	10.655	11.470	11.162
45	0.2	2.824	2.722	2.976	13.120	12.610	13.880	13.203
60	0.2	2.769	2.707	2.997	12.845	12.535	13.985	13.122

Percentage of oil removal data (%)

Time (mins)	Mass of sago hampas before adsorption (g)	Mass of sago hampas after adsorption (g)			Oil removal (%)			Average (%)
		Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
2	0.2	1.752	1.821	1.762	34.876	36.427	35.101	35.468
5	0.2	1.787	1.829	1.906	35.663	36.607	38.337	36.869
10	0.2	1.871	1.943	1.844	37.551	39.169	36.944	37.888
15	0.2	2.013	2.045	2.007	40.742	41.461	40.607	40.937
30	0.2	2.472	2.331	2.494	51.056	47.888	51.551	50.165
45	0.2	2.824	2.722	2.976	58.966	56.674	62.382	59.341
60	0.2	2.769	2.707	2.997	57.730	56.337	62.854	58.974

**Effect of adsorbent dosage**

Adsorption capacity (g/g) data

Adsorbent dosage (g)	Mass of sago hampas after adsorption (g)			Adsorption (g/g)			Average (g/g)
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
0.1	1.584	1.811	1.797	14.840	17.110	16.970	16.307
0.2	2.783	2.430	2.776	12.915	11.150	12.880	12.315
0.3	3.182	3.267	3.151	9.607	9.890	9.503	9.667
0.4	3.447	3.459	3.470	7.618	7.648	7.675	7.647

### Percentage of oil removal data (%)

Adsorbent dosage (g)	Mass of sago hampas after adsorption (g)			Oil removal (%)			Average (%)
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
0.1	1.584	1.811	1.797	33.348	38.449	38.135	36.644
0.2	2.783	2.430	2.776	58.045	56.854	57.888	50.112
0.3	3.182	3.267	3.151	64.764	66.674	64.067	65.168
0.4	3.447	3.459	3.470	68.472	68.742	68.989	68.734

### Effect of pH

#### Adsorption capacity (g/g) data

pH	Mass of sago hampas before adsorption (g)	Mass of sago hampas after adsorption (g)			Adsorption (g/g)			Average (g/g)
		Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
0.5	0.2	2.342	2.174	2.308	10.710	9.870	10.540	10.373
1	0.2	2.479	2.463	2.459	11.395	11.315	11.295	11.335
2	0.2	2.851	2.829	2.847	13.255	13.145	13.235	13.212
4	0.2	2.690	2.850	2.853	12.450	13.250	13.265	12.988
6	0.2	2.618	2.271	2.159	12.090	10.355	9.795	10.747
8	0.2	2.371	2.131	2.256	10.855	9.655	10.280	10.263
10	0.2	2.902	2.738	2.781	13.510	12.690	12.905	13.035

Percentage of oil removal data (%)

pH	Mass of sago hampas before adsorption (g)	Mass of sago hampas after adsorption (g)			Oil removal (%)			Average (%)
		Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
0.5	0.2	2.342	2.174	2.308	48.135	44.360	47.371	46.622
1	0.2	2.479	2.463	2.459	51.213	50.854	50.764	50.944
2	0.2	2.851	2.829	2.847	59.573	59.079	59.483	59.378
4	0.2	2.690	2.850	2.853	55.955	59.551	59.618	58.375
6	0.2	2.618	2.271	2.159	54.337	46.539	44.022	48.299
8	0.2	2.371	2.131	2.256	48.787	43.393	46.202	46.127
10	0.2	2.902	2.738	2.781	60.719	57.034	58.000	58.584

**Effect of unmodified and modified sago hampas**

Adsorption capacity (g/g) data

	Mass of sago hampas after adsorption (g)			Adsorption capacity (g/g)			Average (g/g)
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
Modified Sago Hampas	3.951	3.995	3.982	18.755	18.975	18.910	18.880
Unmodified Sago Hampas	3.232	3.307	3.149	15.160	15.535	14.745	15.147

Percentage of oil removal data (%)

	Mass of sago hampas after adsorption (g)			Oil removal (%)			Average (%)
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
Modified Sago Hampas	3.951	3.995	3.982	84.292	85.281	84.989	84.824
Unmodified Sago Hampas	3.232	3.307	3.149	68.135	69.820	66.270	68.075

FTIR spectra of unmodified sago hampas, modified sago hampas and modified sago hampas loaded with oil at optimum conditions

