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APPENDIX A

Dissolution of Silica Results

Table A1 The dissolution of silica by varied the volume of triethylenetetramine at 70°C and 1 hour.

TETA (mL)	Intilal Silica (g)	Empty Disk (g)	Oven @ 550 °C (g)	Left Silica (g)	Dissolve Silica		Time (h)
					(g)	(%)	
50	1.5006	39.1884	40.4456	1.2572	0.2434	16.22	1
100	1.5004	71.7817	72.7945	1.0128	0.4876	32.50	1
150	1.5000	98.2399	98.9751	0.7352	0.7648	50.99	1
250	1.4999	40.2875	40.6939	0.4064	1.0935	72.90	1
300	1.5001	74.4234	74.8257	0.4023	1.0978	73.18	1
400	1.5002	71.7757	72.1597	0.3840	1.1162	74.40	1

Table A2 The dissolution of silica by varied the temperature of triethylenetetramine at 1 hour.

TETA (mL)	Intilal Silica (g)	Empty Disk (g)	Oven @ 550 °C (g)	Left Silica (g)	Dissolve Silica		Time (h)	Temp (°C)
					(g)	(%)		
300	1.4999	72.1398	73.1052	0.9654	0.5345	35.64%	1	RT
300	1.5004	93.3550	94.0487	0.6937	0.8067	53.77%	1	50
300	1.5005	98.2420	98.7667	0.5247	0.9758	65.03%	1	60
300	1.5001	74.4234	74.8257	0.4023	1.0978	73.18%	1	70
300	1.5002	42.836	43.5829	0.7469	0.7533	50.21%	1	100
300	1.5001	98.2372	99.1201	0.8829	0.6172	41.14%	1	140

Table A3 The dissolution of silica by varied the reaction time of triethylenetetramine for 70°C.

TETA (mL)	Intilal Silica (g)	Empty Disk (g)	Oven @ 550 °C (g)	Left Silica (g)	Dissolve Silica		Time (h)
					(g)	(%)	
300	1.5001	74.4234	74.8257	0.4023	1.0978	73.18%	1
300	1.5000	42.8355	43.1745	0.3390	1.1610	77.40%	3
300	1.5002	74.4184	74.8231	0.4047	1.0955	73.02%	5
300	1.5005	93.3544	93.7635	0.4091	1.0914	72.74%	10

Table A4 The dissolution of silica by varied the NaOH concentration at room temperature (26°C) and 1 hour.

NaOH (M)	Intilal Silica (g)	Empty Disk (g)	Oven @ 550 °C (g)	Left Silica (g)	Dissolve Silica	
					(g)	(%)
0.25	1.4999	69.0743	70.2759	1.2016	0.2983	19.89
0.50	1.4999	93.3475	94.1349	0.7874	0.7125	47.50
0.75	1.5000	39.1904	39.5705	0.3801	1.1199	74.66
1.00	1.5000	74.4161	74.4308	0.0147	1.4853	99.02
3.00	1.4998	98.0350	98.0381	0.0031	1.4967	99.79
5.00	1.5001	22.3849	22.3865	0.0016	1.4985	99.89

Table A5 The dissolution of silica by varied the NaOH concentration at 70°C and 1 hour.

NaOH (M)	Intilal Silica (g)	Empty Disk (g)	Oven @ 550 °C (g)	Left Silica (g)	Dissolve Silica	
					(g)	(%)
0.25	1.4997	71.7821	72.8902	1.1081	0.3916	26.11
0.50	1.5002	93.3473	94.0481	0.7008	0.7994	53.29
0.75	1.5000	74.4265	74.7235	0.2970	1.2030	80.20
1.00	1.5004	71.7796	71.7829	0.0033	1.4971	99.78
3.00	1.5001	72.8899	72.8926	0.0027	1.4974	99.82
5.00	1.5001	22.3849	22.3864	0.0015	1.4986	99.90

APPENDIX B

Calculation the amount of the carbon by temperature programmed oxidation (TPO)

The temperature programmed oxidation technique was used to determine the amount of carbon. It can be calculated from the area under peak of the TPO profile. The carbon dioxide gas was used as the reference peak (so-called A) which was 100 µl. On the other hand, the sample peak was called B.

From $PV = nRT$ (1)

As, P = Pressure (atm), 1 atm

V = Volume (cm^3), 100µl (0.1 cm^3)

n = Number of mole (mole)

R = Gas constant (cm^3.atm/gmole.K), 82.058 cm^3.atm/gmole.K

T = Temperature (K), 31°C (304 K)

Therefore, $n = 4x10^{-6}$ gmole

The carbon dioxide 1 mole gave 1 mole of carbon. So, the carbon dioxide $4x10^{-6}$ mole gave the equal mole of carbon.

Let, Area A has the amount of carbon $4x10^{-6}$ mole. So, the area B has the amount of carbon

The amount of sample's carbon $4x10^{-6}$*B/A

Example: Carbon nanotubes were oxidized at 250°C for 12 hours. Area under pulse peaks of carbon dioxide were

1^{st} peak	2^{nd} peak	3^{rd} peak
$8.50x10^5$	$8.83x10^5$	$8.40x10^5$
Avergae (A)	$8.57x10^5$	

Area under peak of sample, which has weight 2.16 mg, was 1.64×10^{7} (B).

Then, the amount of sample's carbon was 7.65×10^{-5} mole, 9.18×10^{-4} grams. The percentage of carbon was $(9.18 \times 10^{-4}/0.0216) * 100 = 4.25$ wt%.

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