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APPENDICES

Appendix A

Particle size separation

The sedimentation is the method to settle out the particles, basis on the Stoke's law. The ability of the settling particles depending on the several factors as following:

1. Particle size
2. Particle specific gravity
3. Viscosity of suspension
4. Specific gravity of liquid medium.

The large particle will settle faster than small particle in the same liquid as follow by

$$t = \frac{18\,\eta\, h}{(\rho_2-\rho_1)\, g\, D^2}$$

Where :

t	=	minutes of time particle settling,
η	=	viscosity of medium
ρ_1	=	density of liquid
ρ_2	=	density of clay
g	=	980 cm/s^2
D	=	diameter of particle

For centrifugal sedimentation, The centrifugal time can be calculated by

$$t = \frac{63x10^8\, \eta\, \log_{10}(R/S)}{N_m^2 - D_\mu^2 \Delta S}$$

Where :

N_m is the speed of centrifuge in rpm.; ΔS is the difference specificgravity; D_μ is the diameter of particle in micron and R,S is the distance from the rotation axis to sediment and to suspension, respectively.

Appendix B

CEC calculation by methylene blue method

The methylene blue method follow as the ASTM C837-91 (1992) covers the measurement of absorption methylene blue dye in the clay. The methylene blue index can be calculated by this equation

$$MBI = \frac{V \times 0.01 \times 100}{W}$$

Where :

MBI = methylene blue index for the clay in meq/100 g. of clay,

V = milliliters of methylene blue solution increment, and

W = grams of dried clay.

The result in the part IV was average form three experiments

Experiment	Volume of methylene blue (ml)	MBI
1	205.00	102.50
2	195.00	97.50
3	190.00	95.00
average	196.67	98.33

Appendix C

Molecular formula calculation

The molecular formula of clay mineral can be calculated form the chemical content. This experiment should be get rid the SiO_2 around 30% for cristoballite content. The factor *(f) = 44/total charge equivalent*, for unknown structural water content.

The chemical content calculated as follow :

Clay	Weight of oxide (%)							
	Al_2O_3	SiO_2	Fe_2O_3	Na_2O	TiO_2	MgO	K_2O	CaO
Oxide wt.	16.53	75.80	1.42	2.64	0.18	2.75	0.34	0.25
Formula wt.	101.96	60.08	159.69	30.99	79.89	40.31	47.10	56.07
Atom%	0.32	0.90	0.01	0.17	0.002	0.06	0.01	0.004
Atom per unit	2.87	8.00	0.16	1.51	0.02	0.60	0.13	0.04

Appendix D

Absorption of surfactant calculation

The amount absorption of surfactant were calculated from weight loss which eliminated the amount of water (3.7%) and dehydroxylation (3.2%) of Na-clay as the Figure

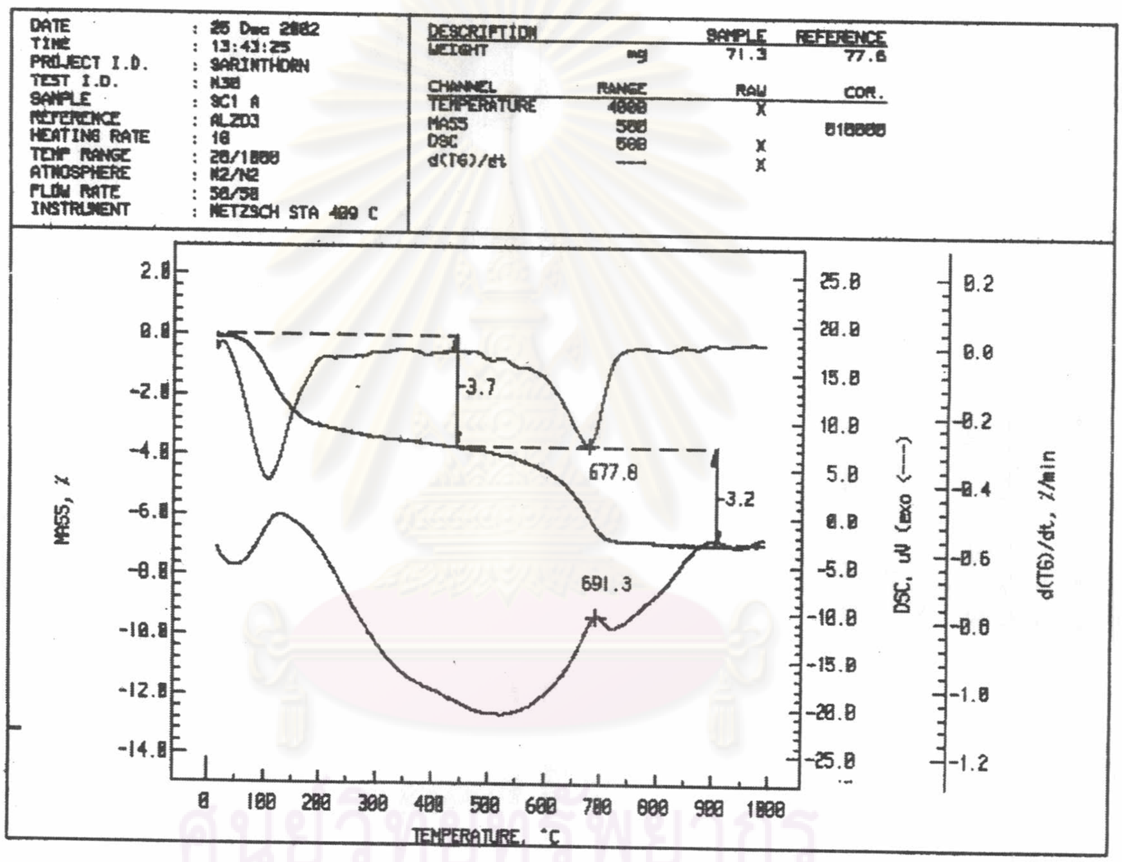

Figure of Thermal analysis of Na-clay in N_2 atmosphere from room temperature to 1000 °C

The total weight loss has been estimated as weight of clay which excluded water and hydroxyl group in the clay structure.

Octadecyltrimethyl ammonium chloride (S18) MW =340.5					area/molecule =19.95 Å^2		area/mmole = 1.2E+22 Å^2			area occupied	
conc.	%wt loss	%water	%OH	mw. S18 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	% efficiency	Å^2	m^2
0	6.9	3.7	3.2								
0.25	11.90	3.41	3.03	305.00	5.00	0.16	94.62	0.1733	69.30	2.11E+21	21.15
0.50	15.80	3.26	2.89	305.00	8.90	0.29	90.43	0.3227	64.54	3.76E+21	37.64
1.00	21.20	3.05	2.71	305.00	14.30	0.47	84.63	0.5540	55.40	6.05E+21	60.48
1.50	25.70	2.87	2.55	305.00	18.80	0.62	79.80	0.7724	51.50	7.95E+21	79.52
2.00	29.20	2.74	2.43	305.00	22.30	0.73	76.04	0.9615	48.08	9.43E+21	94.32
2.50	32.10	2.63	2.33	305.00	25.20	0.83	72.92	1.1330	45.32	1.07E+22	106.59

Octadecyltrimethyl ammonium chloride (S18) after wash Chloride											
conc.	%wt loss	%water	%OH	mw. S18 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	% efficiency	Å^2	m^2
0.50	15.37	3.27	2.91	305.00	8.47	0.28	90.89	0.31	61.11	3.67E+21	36.69
1.00	18.81	3.14	2.79	305.00	11.91	0.39	87.20	0.45	44.78	5.38E+21	53.78
1.50	23.03	2.98	2.65	305.00	16.13	0.53	82.67	0.64	42.65	7.68E+21	76.83
2.00	29.57	2.72	2.42	305.00	22.67	0.74	75.64	0.98	49.13	1.18E+22	118.01
2.50	27.23	2.81	2.50	305.00	20.33	0.67	78.15	0.85	34.11	1.02E+22	102.43

di-octadecyltrimethyl ammonium chloride (D18) MW =573.0					area/molecule =51.01 Å² area/mmole = 3.07E+22 Å²					area occupied	
conc.	%wt loss	%water	%OH	mw. D18 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	%efficiency	Å²	m²
0	6.9	3.7	3.2								
0.25	20.94	3.06	2.72	537.50	14.04	0.26	84.91	0.3076	123.05	9.45E+21	94.46
0.50	31.17	2.66	2.37	537.50	24.27	0.45	73.92	0.6108	122.16	1.88E+22	187.55
1.00	44.44	2.15	1.91	537.50	37.54	0.70	59.67	1.1704	117.04	3.59E+22	359.38
1.50	49.53	1.95	1.73	537.50	42.63	0.79	54.20	1.4632	97.55	4.49E+22	449.27
2.00	45.88	2.09	1.86	537.50	38.98	0.73	58.12	1.2477	62.38	3.83E+22	383.10
2.50	53.26	1.81	1.61	537.50	46.36	0.86	50.20	1.7182	68.73	5.28E+22	527.57

di-octadecyltrimethyl ammonium chloride (D18) after wash treatments											
conc.	%wt loss	%water	%OH	mw. D18 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	%efficiency	Å²	m²
1.00	44.44	2.15	1.91	537.50	37.54	0.70	59.67	1.17	117.04	3.59E+22	359.38
EtOH	33.10	2.59	2.30	537.50	26.20	0.49	71.85	0.68	67.84	2.08E+22	208.31
reflux	35.00	2.51	2.23	537.50	28.10	0.52	69.81	0.75	74.89	2.30E+22	230.04
Reflux (2.5 mmol)	35.70	2.49	2.21	537.50	28.80	0.54	69.06	0.78	77.59	2.38E+22	238.24

Tricaprylyl methyl ammonium chloride (T8) MW =404.17					area/molecule =80.12 Å^2 area/mmole = 4.28E+22 Å^2					area occupied	
conc.	%wt loss	%water	%OH	mw. T8 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	%efficiency	Å^2	m^2
0	6.9	3.7	3.2								
0.50	20.10	3.09	2.75	368.67	13.20	0.36	85.81	0.4172	83.45	2.01E+22	201.24
1.00	27.60	2.80	2.49	368.67	20.70	0.56	77.76	0.7221	72.21	3.48E+22	348.27
1.50	32.50	2.61	2.32	368.67	25.60	0.69	72.50	0.9578	63.86	4.62E+22	461.98
2.00	35.50	2.49	2.22	368.67	28.60	0.78	69.27	1.1199	55.99	5.40E+22	540.12

Methyl polyoxyethylene(15)octadecanammonium chloride (EO18) MW =979.5					area/molecule =80.12 Å^2 area/mmole = 4.82E+22 Å^2					area occupied	
conc.	%wt loss	%water	%OH	mw. EO18 free Cl	%wt alkyl	mmol	wt.clay include OH and water	mmol/g clay	%efficiency	Å^2	m^2
0	6.9	3.7	3.2								
0.50	34.80	2.52	2.24	944.00	27.90	0.30	70.02	0.42	84.41	2.04E+22	203.57
1.00	42.50	2.22	1.98	944.00	35.60	0.38	61.76	0.61	61.07	2.95E+22	294.53
1.50	41.60	2.26	2.01	944.00	34.70	0.37	62.72	0.59	39.07	2.83E+22	282.66
2.00	41.60	2.26	2.01	944.00	34.70	0.37	62.72	0.59	29.30	2.83E+22	282.66

VITAE

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