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APPENDICES

Appendix A Determination of methyl red adsorption by porous sample

The amount of methyl red (MR) adsorbed onto porous sample was calculated following equation:

$$q = \frac{V (C_0 - C)}{mS}$$

Where, q = The amount of MR adsorbed onto porous sample (mol/m^2)

C_0 = The initial concentration of MR solution (mol/l)

C = The residual concentration of MR solution (mol/l)

V = The solution volume (l)

m = Mass of porous sample (g)

S = BET surface area of porous sample (m^2/g) sample (mol/m^2)

Table A1 Adsorption of methyl red by APPCH and PCH

Sample	BET Surface area (m^2/g)	Residual Concentration (mol/l)	Amount of Methyl Red Adsorption (mol/m^2)
PCH	524.1	4.17×10^{-5}	1.51×10^{-7}
APPCH (0.95: 0.05)	275.2	1.76×10^{-5}	3.32×10^{-7}

Appendix B Determination of Total Volatile Basic Nitrogen (TVB-N)

TVB-N can be calculated by following equation:

$$\text{TVB-N (mg/100g)} = \frac{(V_S - V_B) \times (N_{HC} \times A_N) \times [W_S \times (M/100) + V_E] \times 100}{W_S}$$

Where, V_S = Titration volume of 0.01 N HCl for sample extract (ml)

V_B = Titration volume of 0.01 N HCl for blank (ml)

N_{HCl} = Normality of HCl (= 0.01 N × factor of HCl)

A_N = Atomic weight of nitrogen (14.00)

W_S = Weight of tissue sample (g)

M = Percentage moisture of tissue sample (Assume 80%)

V_E = Volume of 4% TCA used in extraction

Table B1 Change in TVB-N Values of fresh fish during storage at ambient temperature

Hours	0.01 HCl (ml)	TVB-N (mg/100g)
0	0.15	10.08
3	0.20	13.44
6	0.35	23.23
9	0.60	40.32
12	0.80	53.76
15	1.40	94.08
18	1.00	67.20
21	1.00	67.20
24	1.20	80.64

Appendix C Mechanical Measurement of nanocomposites

Table C1 Mechanical properties of PP/APPCH-MR nanocomposite

Sample	Young's Modulus (MPa)	Tensile Strength (MPa)	Elongation at Yield (%)
PP	1201.63 ± 98.73	36.03 ± 2.00	9.70 ± 0.72
PP/6%wtSurlyn	1103.01 ± 72.05	33.48 ± 1.55	8.49 ± 0.47
PP/6%wtS/2%wtClay (10:1)	1035.02 ± 61.82	28.95 ± 2.16	7.05 ± 0.57
PP/6%wtS/2%wtClay (20:1)	1071.31 ± 66.21	29.51 ± 1.82	7.46 ± 0.62
PP/6%wtS/2%wtClay (30:1)	1054.14 ± 69.34	29.88 ± 2.51	7.21 ± 0.86

Table C2 Mechanical properties of LDPE/PCH-BTB nanocomposites

Sample	Young's Modulus (MPa)	Tensile Strength (MPa)	Elongation at Yield (%)
LDPE	200.19 ± 7.17	8.69 ± 0.30	19.13 ± 5.33
LDPE/6%wtSurlyn	215.75 ± 13.35	8.81 ± 0.47	15.35 ± 2.34
LDPE/6%wtS/2%wtClay (10:1)	221.72 ± 8.62	9.00 ± 0.43	14.42 ± 2.00
LDPE/6%wtS/2%wtClay (20:1)	215.26 ± 14.48	8.94 ± 0.51	16.64 ± 2.03
LDPE/6%wtS/2%wtClay (30:1)	216.67 ± 15.94	8.68 ± 0.46	15.46 ± 2.76

Appendix D Oxygen Gas Transmission Rate of Nanocomposites

Table D1 Oxygen gas transmission rate of PP and PP/APPCH-MR nanocomposites

Sample	Oxygen gas transmission rate (cc/m^2.day)
PP	148 ± 3.39
PP/APPCH-MR (30:1)	140 ± 2.97

Table D2 Oxygen gas transmission rate of LDPE and LDPE/PCH-BTB nanocomposites

Sample	Oxygen gas transmission rate (cc/m^2.day)
LDPE	257 ± 7.07
LDPE/PCH-BTB (10:1)	225 ± 0.85
LDPE/PCH-BTB (30:1)	230 ± 7.07

Appendix E Bentonite Clay, Mac-Gel® GRADE SAC

Table E1 Typical chemical analysis of bentonite on dry basis at 105°C

Element	Percentage
SiO_2	65 - 70
Al_2O_3	13 - 17
Fe_2O_3	1.0 - 2.0
Na_2O	1.5 - 2.5
LOI	10 - 12
MgO	2.0 - 3.0
CaO	1.5 - 2.5
K_2O	0.4 - 0.8
TiO_2	0.2 - 0.3

Table E2 Physical properties of bentonite

Moisture content, %	8 - 12
5% suspension, pH	9.5 - 11.0
Swelling index, ml per 2 g of clay	15
Viscosity dial reading at 600 rpm	12 - 20
Dry particle size (pass 200 meshes), %	80 min
Wet particle size (pass 325 meshes)	98 min
Specific gravity	2.3 - 2.4
CEC, meq/100g of clay	44.5

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2. Boonruang, S., Magaraphan, R. and Manuspiya, H. (2012, April 24) Chromophores Modified Porous Clay Heterostructure for Smart Packaging Films. Proceedings of the 18^{th} PPC Symposium in Petroleum, Petrochemical and Polymers, Bangkok, Thailand.

Presentations:

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