



Europäisches  
Patentamt  
European  
Patent Office  
Office européen  
des brevets

# Combination Sets

Examples in the fields of C08F10 to 301, C08L, C09D, C09J



## C08F

1. US2012/0004383: Copolymers of Monocarboxylic Acids and Dicarboxylic Acids
2. WO2011/144306: Vinyl Heterocycles
3. WO2013/103528 Polymers Containing Acetoacetate Moiety
4. US2013/0171566: Alkaline Soluble Resin and Light Sensible Resin
5. US2013/0172490: Copolymer and Method for Manufacturing the Same
6. US2013/0177980: Synthetic Matrices for Self-Renewal and Expansion of Stem Cells

# 1. US2012/0004383: Maleic anhydride/Acrylic acid copolymer

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2012/0004383 A1**  
**LAUBENDER et al.** (43) **Pub. Date: Jan. 5, 2012**

(54) **COPOLYMERS OF MONOCARBOXYLIC ACIDS AND DICARBOXYLIC ACIDS, THEIR PREPARATION AND USE**

(75) Inventors: **Matthias LAUBENDER**, Schifferstadt (DE); **Ewald Heintz**, Schweigen-Rechtenbach (DE); **Clarissa Seidl**, Neuhofen (DE); **Bolette Urtel**, Bobenheim-Roxheim (DE); **Alexsandro Berger**, Rosenheim (DE)

(73) Assignee: **BASF SE**, Ludwigshafen (DE)

(21) Appl. No.: **13/174,955**

(22) Filed: **Jul. 1, 2011**

#### Related U.S. Application Data

(60) Provisional application No. 61/360,534, filed on Jul. 1, 2010.

#### Publication Classification

(51) **Int. Cl.**  
*C08F 2/38* (2006.01)  
*C08F 222/02* (2006.01)  
*C08F 222/04* (2006.01)  
*C08F 4/30* (2006.01)

(52) **U.S. Cl.** ..... **526/229.5; 526/233**

(57) **ABSTRACT**

The invention relates to a process for preparing a polymer by free-radical polymerization of at least one ethylenically unsaturated monocarboxylic acid and/or a salt thereof, at least one ethylenically unsaturated dicarboxylic acid and/or an anhydride and/or a salt thereof, in the presence of hypophosphorous acid and/or a salt thereof. The invention also relates to a polymer composition obtainable by this process. The invention also relates to the use of such a polymer composition as detergent additive, e.g. as dispersant, scale inhibitor or sequestrant for laundry detergents.

# 1. Maleic anhydride/Acrylic acid copolymer

## EXAMPLE 1

C08F222/04

C08F220/06

Single Symbol

Invention: C08F220/06

Combination Set:

C08F220/06 A, C08F222/04

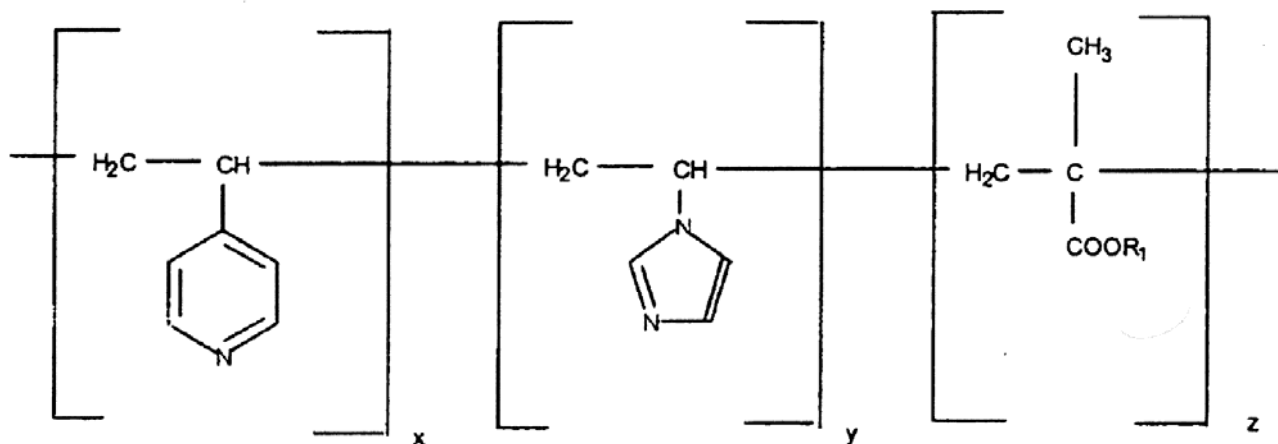
[0125] The weight ratio of acrylic acid to maleic anhydride is 70:30. A 2 L reactor is charged with 214.00 g of deionized water and 117.60 g maleic anhydride are placed under nitrogen, and heated to a inside temperature of 60° C. while stirring. When an internal temperature of 60° C. is reached, 172.80 g of a 50% solution of caustic soda is added over the course of two hours, allowing the internal temperature of the vessel to rise to 100° C. After completion of the addition of caustic soda, 325.00 g of acrylic acid, and 261.60 g of an aqueous solution of sodium hypophosphite (59%) are charged linearly at such a rate that the addition is complete in four hours. Simultaneously, 398.34 g of aqueous hydrogen peroxide (4.4%) initiator are charged linearly into the vessel such that the addition is complete in five hours. Postpolymerization is commenced at 100° C. for one hour. The vessel is cooled to 80° C., and 300.00 g of a 50% sodium hydroxide solution is charged into the vessel for one hour. The inside temperature is maintained at 80° C. during this step. The copolymer is isolated and evaluated for molecular weight and % residual monomer.

Example 4 Maleic acid in majority  
Combination Set:

C08F222/04 A, C08F220/06

## 2. WO2011/144306: Vinyl Heterocycles

Copolymer of formula:



(II)

## 2. Vinyl Heterocycles

### Example 7

#### *Synthesis of vinyl imidazole-methyl methacrylate copolymer*

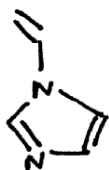
15 *(Copolymer according to formula (II) with  $y=1$ ,  $x=0$  and  $z=11$ )*

MMA:

C08F220/14

NVI:

C08F226/06



20 Using the same procedure as described in Example 1, 6.70 ml (6.32 g, 63.1 mmol) of methyl methacrylate and 0.71 ml (0.74 g, 7.84 mmol) of vinyl imidazole were caused to react in 15 ml of toluene, in the presence of 64 mg (0.39 mmol) of AIBN (azobisisobutyronitrile). The solution was heated under stirring to 65°C-70°C for 48 hours. After returning the reaction mixture to ambient temperature, the copolymer was precipitated out by slowly pouring the solution into 150-200 ml of methanol, which was kept stirring. The suspension containing the precipitate was filtered, the precipitate was further washed with methanol and dried under  
25 vacuum at 40°C/21 mbar, yielding 6.7 g of copolymer.

Single Symbol Invention: C08F220/14

Combination Set: C08F220/14 A, C08F226/06



## 2. Vinyl Heterocycles

### Example 14

- 5 **Synthesis of 4-vinyl pyridine-vinyl imidazole-methyl methacrylate terpolymer (terpolymer according to formula (II) with  $x=1$ ,  $y=2$  and  $z=6$ )**

MMA:

C08F220/14

NVI:

C08F226/06

4-VP

C08F226/06

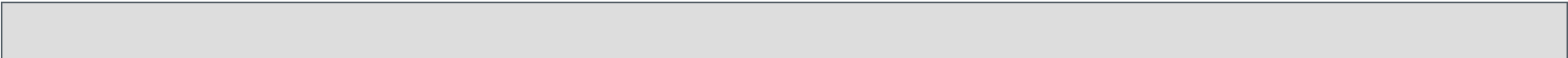
Using the same procedure as described in Example 1, 3.20 ml (3.0 g, 29.96 mmol) of methyl methacrylate, 1.98 ml (2.05 g, 21.79 mmol) of vinyl imidazole and 0.29 ml (0.29 g, 2.72 mmol) of 4-vinyl pyridine in 12 ml of toluene were caused to react in the presence of 49 mg (0.30 mmol) of AIBN (azobisisobutyronitrile). The solution was heated to 65°C-70°C under stirring for 48 hours. After returning the reaction mixture to ambient temperature, the copolymer was isolated by evaporation of the solvent under vacuum at 40°C/21 mbar yielding 5.29 g of copolymer.

Single Symbol Invention : C08F220/14

Combination Set: C08F220/14 A, C08F226/06, C08F226/06

## **C08F, C08L, C09D, C09J**

7. US2013/101819: Adhesive Tape
8. US2011/0247746: Use of Synthetic Adhesives
9. US2014/0072717: Polyepoxide-Polyacid Coating Compositions
10. WO2012/130817: Waterborne Coating Compositions
  
11. EP2631272: (Meth)acrylic Resin Film





# 7.US2013/101819 Adhesive Tape

comprising PSA composition Acrylic-OH and polyisocyanate crosslinker

## EXAMPLES

**[0064]** Detailed description will be made below with reference to examples. However, the present invention is by no means restricted to such examples.

### [Preparation of Acrylic Copolymer]

**[0065]** 2.9 parts by mass of acrylic acid, 5 parts by mass of vinyl acetate, 92 parts by mass of butyl acrylate, and 0.1 parts by mass of hydroxyethyl acrylate, and, as a copolymerization solvent, 30 parts by mass of ethyl acetate and 120 parts by mass of toluene, were input to a reaction container including a stirrer, a reflux condenser, a thermometer, a dripping device, and a nitrogen inlet pipe, and the materials thus input were stirred for 2 hours while introducing nitrogen gas into the reaction container. After the oxygen contained in the copolymer system was removed by means of nitrogen substitution, 0.2 parts by mass of AIBN (2,2'-azobisisobutyronitrile) were further added to the reaction container, and a copolymerization reaction was performed for 6 hours after the temperature was raised to 60° C. As a result, the acrylic copolymer thus obtained contained solid content of 40.0% by weight, having a weight-average molecular weight of 500,000.

2,9 AAc	C08F220/06
5 VAc	C08F218/08
92 BA	C08F2220/1825
0,1 HEA	C08F220/20

**Combination Set:** C08F2220/1825, C08F218/08, C08F220/06, C08F220/20

## 8. US2011/0247746 Acrylic dispersions: Polymerisation and adhesives

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2011/0247746 A1**  
**SCHUMACHER et al.** (43) **Pub. Date: Oct. 13, 2011**

(54) **USE OF SYNTHETIC ADHESIVES IN THE  
MANUFACTURE OF CORRUGATED  
FIBERBOARD**

(75) **Inventors:** **Karl-Heinz SCHUMACHER**,  
Neustadt (DE); **Gledison Fonseca**,  
Mannheim (DE); **Rabie Al-Hellani**,  
Ludwigshafen (DE); **Wolfgang  
Gaschler**, Niederwinkling (DE);  
**Ellen Krüger**, Otterstadt (DE);  
**Andrea Herold**, Weinheim (DE);  
**Hildegard Stein**, Mexico D.F.  
(MX); **Oliver Hartz**, Limburgerhof  
(DE); **Hubertus Kröner**, Neustadt  
(DE)

(73) **Assignee:** **BASF SE**, Ludwigshafen (DE)

(21) **Appl. No.:** **13/083,028**

(22) **Filed:** **Apr. 8, 2011**

### **Related U.S. Application Data**

(60) **Provisional application No. 61/322,317, filed on Apr.  
9, 2010.**

### **Publication Classification**

(51) **Int. Cl.**  
**B31F 1/20** (2006.01)  
**B32B 37/12** (2006.01)

(52) **U.S. Cl.** ..... **156/210; 156/332**

(57) **ABSTRACT**

Described is the use of synthetic adhesives in the manufacture of corrugated fiberboard at relatively low temperatures and high lineal speeds. The corrugated fiberboard includes a corrugated sheet of paper and a flat linerboard and the corrugation of the corrugated sheet of paper is produced at paper temperatures below 95° C. and at a lineal speed above 150 m/min. The production of the corrugation of a corrugated sheet of paper is immediately followed by a continuous operation in which a preferably unheated corrugated board adhesive is applied and the corrugated sheet of paper is adhered to at least one first linerboard. The corrugated board adhesive used is an aqueous adhesive dispersion based on at least one synthetic, dispersed polymer having preferably more than 40% by weight solids content, selected from acrylate copolymers, copolymers of vinylaromatics and conjugated aliphatic dienes and vinyl acetate-alkylene copolymers, wherein the glass transition temperatures of the polymers are above 20° C. and (preferably at least 5° C.) below the surface temperature of the corrugated sheet of paper to which they are applied.

## 8. US2011/0247746 Acrylic dispersions: Polymerisation and adhesives

### Inventive Example 1

[0059] Copolymer formed from 39.5 parts by weight of n-butyl acrylate, 56.5 parts by weight of styrene, 4 parts by weight of methacrylic acid, emulsion polymerized in water in the presence of 0.1 part by weight of tert-dodecyl mercaptan, 1.2 parts by weight of Disponil® FES 27 emulsifier, 0.25 part by weight of Dowfax 2A1 emulsifier, 0.6 part by weight of sodium persulfate (initiator).

[0060] Solids content: 49%, pH 6.2, Tg +41° C.

Styrene, n-Butyl acrylate, Methacrylic acid

Combination Set: C08F212/08, C08F2220/1825, C08F220/06

### Inventive Example 3

[0063] Copolymer formed from 38 parts by weight of n-butyl acrylate, 55 parts by weight of styrene, 5 parts by weight of vinyl acetates, 2 parts by weight of acrylic acid, emulsion polymerized in water in the presence of 0.1 part by weight of tert-dodecyl mercaptan, 1.2 parts by weight of Disponil® FES 27 emulsifier, 0.25 part by weight of Dowfax 2A1 emulsifier, 0.6 part by weight of sodium persulfate (initiator).

[0064] Solids content: 49%. pH 4.0. Tg +35° C.

Styrene, n-Butyl acrylate, Vinyl acetate, Methacrylic acid

Combination Set: C08F212/08, C08F2220/1825, C08F218/08, C08F220/06

### Inventive Example 10

[0077] Copolymer formed from 56.5 parts by weight of styrene, 32.0 parts by weight of butadiene, 11 parts by weight of acrylic acid; 0.5 part by weight of itaconic acid, emulsion polymerized in water in the presence of 1.1 parts by weight of tert-dodecyl mercaptan, 0.5 part by weight of Lumiten I-SC, 0.9 part by weight of sodium persulfate.

[0078] Solids content: 52%, pH 5.6, Tg +26.3° C.

Styrene, Butadiene, Methacrylic acid, Itaconic acid

Single Symbol: C08F212/08

Combination Set : C08F212/08, C08F236/10, C08F220/06, C08F222/02

## 9. US2014/0072717 Coating composition comprising two copolymers: (a) **Epoxy**-containing acrylic and (b) **acid**-containing copolymers

15. A film-forming composition comprising:

(a) an epoxy-containing acrylic polymer; and

(b) a curing agent comprising an acid functional acrylic polymer present in an amount of at least 50 percent by weight, based on the total weight of the curing agent,

wherein the acid functional acrylic polymer comprises a reaction product of an ethylenically unsaturated monomer composition comprising ethylenically unsaturated acid and the acid functional acrylic polymer has: (i) a weight average molecular weight of 500 to 6000; (ii) a polydispersity value of no more than 2.5; and (iii) an acid value of at least 180, and

wherein the composition has a resin solids content of greater than 40 percent by weight, based on the total weight of the composition.

## 9. (a) Epoxy-containing acrylic copolymer

### Example 5: Preparation of Epoxy-containing acrylic polymer

**[0064]** An epoxy-containing acrylic polymer was prepared from the following mixture of ingredients:

Ingredients	Weight (grams)	Resin Solids
<b>Charge 1</b>		
Solvesso 100	38.29	
<b>Charge 2</b>		
Glycidyl methacrylate	67.86	67.86
Butyl methacrylate	65.76	65.76
$\alpha$ -methyl styrene dimer	2.1	2.1
<b>Charge 3</b>		
Solvesso 100	14.93	
t-amyl peroxyacetate	21.33	12.79
<b>Charge 4</b>		
Glycidyl methacrylate	12.15	12.15
Methyl methacrylate	0.32	0.32
Styrene	1.12	1.12
$\alpha$ -methyl styrene dimer	0.62	0.62
<b>Charge 5</b>		
Methyl ether propylene glycol acetate	14.06	
Di-t-amyl peroxide	0.16	
<b>TOTAL</b>	<b>239.7</b>	<b>162.72</b>

C08F2220/325  
C08F2220/1825

C08F2220/325  
C08F2220/14  
C08F212/08

Combination Set: C08F2220/325, C08F2220/1825, C08F212/08, C08F2220/14

Single Symbol: C08F220/32

## 9. (b) acid-containing copolymer

Table 1

		Example 1	Example 2	Example 3	Example 4
First reactor charge (grams)	Acrylic acid	1842.5	1407.0	1340.0	1273.3
	2-ethylhexyl acrylate	1485.0	2793.0		1026.3
	Styrene	550.0			380.1
	Methyl methacrylate	1622.5			1121.2
	Butyl methacrylate			2660.0	
Second reactor charge (grams)	di-t-butyl perbenzoate	330.0	252.0	240.0	228.1
	Solvesso 100	275.0	210.0	200.0	190.0
Monomer composition (weight %)	di-t-butyl perbenzoate	55.0	42.0	40.0	38.0
	Acrylic acid	33.5	33.5	33.5	33.5
	2-ethylhexyl acrylate	27	66.5		27
	Styrene	10			10
	Methyl methacrylate	29.5			29.5
Initiator level (% by weight on monomers)	Butyl methacrylate			66.5	
	First reactor	6	6	6	6
	Second reactor	1	1	1	1

C08F220/06  
C08F2220/1858  
C08F212/08  
C08F220/14  
C08F2220/1825

Ex 1: Combination Set: (C08F220/06, C08F220/14, C08F2220/1858, C08F212/08)  
Single Symbol: C08F220/06

## 9. Coating composition comprising : (a) **Epoxy**-containing acrylic and (b) **acid**-containing copolymers

### Example C

[0071] A transparent film-forming composition similar was prepared by mixing the following ingredients.

Ingredients	Total Weight (grams)	Resin Solids Weight (grams)
Ethyl 3-Ethoxypropionate	46.55	
Tinuvin 328	1.87	
Tinuvin 123	0.36	
Product of Example 5	81.9	53.31
Product of Example 1	72.61	46.69
DYNOADD F1 <sup>3</sup>	0.1	
Armeen M2C <sup>4</sup>	1.45	
DISPARLON OX-60 <sup>5</sup>	0.11	

Combination Set: **C09D133/068**, **C08L33/02**  
Single Symbol: **C09D133/068**



## 9. Coating composition **Epoxy** acrylate and **polyester** (comparative)

### **Example A**

**[0067]** A clear film-forming composition was prepared by mixing together the following ingredients.

Ingredients	Total Weight (grams)	Resin Solids Weight (grams)
Ethyl 3-Ethoxypropionate	23.55	--
Tinuvin 328 <sup>1</sup>	1.87	--
Tinuvin 123 <sup>1</sup>	0.36	--
Product of Example 5	81.13	52.82
Polyacid half-ester of di-trimethylolpropane and methylhexahydrophthalic anhydride <sup>2</sup>	66.45	47.18
DYNOADDF1 <sup>3</sup>	0.1	--
Armeen M2C <sup>4</sup>	1.45	--
DISPARLON OX-60 <sup>5</sup>	0.11	--

<sup>1</sup> UV absorber or hindered amine light stabilizer available from BASF

<sup>2</sup> Prepared as in Example F of U.S. Patent No. 5,256,452A

<sup>3</sup> Flow additive available from Dynea Oy

<sup>4</sup> Tertiary amine available from AkzoNobel Chemicals

<sup>5</sup> Surface tension modifier available from Kusumoto Chemicals

Combination Set: C09D133/068, C08L67/00

## 10. Acrylic-Alkyd coating composition

- WO2012/130817:

---

### (54) Title: WATERBORNE COATING COMPOSITION

**(57) Abstract:** The invention relates to an aqueous dispersion for use as open time improver in a coating composition which aqueous polymer dispersion comprises a first polymer having a number average molecular weight (Mn) of from 2,000 to 120,000 (determined by gel permeation chromatography using a mixture of tetrahydrofuran and acetic acid as eluent), an acid value of from 30 to 150 mg KOH/g, and an ethylene-oxide wt% (on total solid polymer) of from 1 to 20 wt%, said first polymer dispersion being obtainable by free radical polymerization of a monomer mixture in the presence of at least one free-radical initiator and at least one surfactant, said monomer mixture comprising : a) 5 to 20 wt%, preferably 7 to 10wt%, acid functional ethylenically unsaturated monomers or precursors thereof or ethylenically unsaturated monomers comprising ionic group precursors; b) 5 to 25 wt%, preferably 7 to 20 wt%, ethylenically unsaturated monomers containing polyethylene oxide, polyethylene glycol or mono-alkoxypolyethylene glycol moiety c) up to 90 wt% of non-ionic ethylenically unsaturated monomers other than a) or b); d) 0 to 10 wt% ethylenically unsaturated monomers with a functional group for cross-linking e) 0 to 10 wt% of chain transfer agents; f) up to 90 wt% non-ionic ethylenically unsaturated monomers other than c), wherein 30 to 90 wt%, more preferably 60 to 80 wt% comprise crosslinkable groups or precursors thereof; wherein the sum of a) through f) is 100wt%. The invention further relates to a method for making the first polymer dispersion, the use of said aqueous dispersion as an open time improver in a coating composition, to aqueous coating compositions comprising a blend of at least a first aqueous polymer dispersion and a second aqueous polymer dispersion comprising a film-forming second polymer and to a method for making said coating composition.

# 10. Acrylic copolymer

alkyd emulsion or urethane modified alkyd emulsion.

## DETAILED DESCRIPTION OF THE INVENTION

- [0020] In a particular aspect the invention relates to an aqueous dispersion, for use in the coating composition according to the invention as the first aqueous polymer dispersion, comprising
- ) a first polymer having a number average molecular weight (Mn) of from 2,000 to 120,000 (determined by gel permeation chromatography using a mixture of tetrahydrofurane and acetic acid as eluent), an acid value of from 30 to 150 mg KOH/g, and an ethylene-oxide wt% (on total solid polymer) of from 1 to 20 wt%, said first polymer dispersion being obtainable by free radical polymerization of a monomer mixture in the presence of at least one free-radical initiator and at least one surfactant, said monomer mixture comprising:

### **Example 1. Preparation of aqueous polymeric vinyl dispersion polymer having both ethylene oxide and carboxylic acid functionality (resin example 1)**

[0061] In an emulsion polymerization reactor the pre-emulsion was made as follows: 454 grams of water and 5 grams of an anionic polymerizable surfactant (Adeka Reasoap SR 1025, ex Adeka) was added and heated to 70 °C. In the feed-tank a mixture of 117 grams of water, 22.8 grams of the anionic polymerizable surfactant Adeka Reasoap SR 1025 and 0.30 grams of sodium lauryl sulphate were mixed for 5 minutes. The monomer pre-emulsion was prepared by adding the following raw materials in the feed tank: 109.5 grams of methyl methacrylate, 24.2 grams of methoxy polyethyleenglycol 550 methacrylate (ex. Cognis), 24.2 grams of methacrylic acid, 145.7 grams of butyl methacrylate, 3.56 octyl mercaptane and 1.75 grams of mercapto ethanol. Emulsify the feed until a stable pre-emulsion was obtained.

Add 5 weight % of the pre-emulsion to the reactor. Heat the reactor to 80 °C. Add a solution of

## 10. Acrylic copolymer

Table 2. Monomer compositions for pre-emulsions.

Example	2	3	4	5	6	7
Methyl methacrylate	10.96	10.99	10.99	10.99	11.00	10.98
Methoxy polyethylene glycol methacrylate 550	4.92	2.34	2.25	2.64	2.43	2.43
Methacrylic acid	2.42	2.43	2.43	2.43	2.43	2.43
Butyl methacrylate	12.09	14.72	14.81	14.41	14.63	14.61
N-Octyl mercaptane	0.36	0.37	0.37	0.37	0.37	0.37
2-Mercapto ethanol	0.18	0.18	0.18	0.18		0.18

C08F220/14  
C08F2220/286  
C08F220/06  
C08F2220/1825

The molecular weights determined by GPC are:

Single Symbol Invention: C08F220/18

Combination set: C08F2220/1825, C08F220/14, C08F2220/286, C08F220/06

# 10. Coating composition

-17-

Table 4. <sup>→ C09D</sup> Coating compositions according to the invention.

Variation on ratio of first and second binder	Ratio on solids		ICI viscosity (Poise)	Open time (min)	Gloss 20° after 7 days (%)	Koenig hardness after 7 days (s)
	first polymer dispersion	second polymer dispersion				
First polymer dispersion: example <i>acrylic</i> 1. Second polymer dispersion : ex. 1 <i>PU-AIKYD</i> from EP2024412	0	100	3.0	10.0	55	
	25	75	2.7	9.0	49	
	50	50	2.6	12.0	57	
	60	40	2.4	9.0	47	
First polymer dispersion: example 2. Second polymer dispersion : ex. 1 from EP2024412	0	100	3.4	9.5	74	29
	10	90	3.4	10.0	72	33
	20	80	3.1	10.0	71	34
	30	70	3.3	9.5	70	31
	40	60	3.0	11.5	66	35
	45	55	3.2	12.0	61	34
	50	50	3.1	14.0	52	35
	60	40	2.7	12.5	39	40

Compositions  
C08L33/14

C08L75/14

Coatings  
(one polymer):  
C09D133/14  
C09D175/14

POLYMER IS MAJOR: C09D133/14, C08L75/14

**Combination Set:** First polymer in majority: C09D133/14, C08L75/14

**Combination Set:** Second polymer in majority: C09D175/14, C08L33/14

## C08L

- 12. US2011/0152402: Thermoplastic Resin Compositions
- 13. US2011/0237749: Thermoplastic Molding Compositions
- 14. US2013/0012646: Styrene-based Resin Compositions
- 15. US2013/0253102: Biodegradable Plastic Material
- 16. US2013/0237648: Compatibilized Compositions
- 17. US2014/0110750: Curable Composition

## 12. US2011/0152402 Thermoplastic composition

(19) **United States**

(12) **Patent Application Publication**

**Jin et al.**

(10) **Pub. No.: US 2011/0152402 A1**

(43) **Pub. Date: Jun. 23, 2011**

(54) **THERMOPLASTIC RESIN COMPOSITION  
HAVING GOOD SCRATCH RESISTANCE AND  
MOLDED ARTICLE MADE THEREFROM**

(75) Inventors: **Sung Hun Jin**, Uiwang-si (KR);  
**Chang Min Hong**, Uiwang-si  
(KR); **Dong Hui Chu**, Uiwang-si  
(KR); **Tae Woog Jang**, Uiwang-si  
(KR); **In Chol Kim**, Uiwang-si  
(KR); **Yu Ho Kim**, Uiwang-si  
(KR); **Don Keun Lee**, Uiwang-si  
(KR)

(73) Assignee: **CHEIL INDUSTRIES INC.**,  
Gumi-si (KR)

(21) Appl. No.: **12/971,348**

(22) Filed: **Dec. 17, 2010**

(30) **Foreign Application Priority Data**

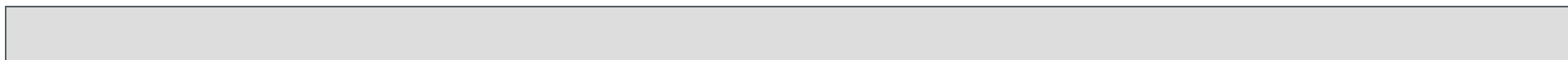
Dec. 23, 2009 (KR) ..... 2009-129622  
Nov. 10, 2010 (KR) ..... 2010-111405

**Publication Classification**

(51) **Int. Cl.**  
**C08L 51/04** (2006.01)  
(52) **U.S. Cl.** ..... **523/122; 525/78; 525/76; 525/75;**  
**525/77; 524/504**

(57) **ABSTRACT**

The present invention provides a thermoplastic resin composition that can have improved scratch resistance comprising: (A) about 10 to about 20% by weight of a rubber modified aromatic vinyl graft copolymer resin; (B) about 30 to about 50% by weight of polymethylmethacrylate (PMMA) resin; and (C) about 40 to about 60% by weight of an aromatic vinyl copolymer resin including about 5 to about 50% by weight of a (meth)acrylate alkyl ester. The thermoplastic resin composition of the present invention can have a good balance of various properties such as scratch resistance, impact strength, colorability, gloss, and injection molding properties.





# 12. Thermoplastic composition

## EXAMPLES

[0047] The base resins used in Examples and Comparative Examples are prepared as follows.

[0048] (A) Core-Shell Rubber Modified Aromatic Vinyl Graft Copolymer Resin

[0049] The core-shell rubber modified aromatic vinyl graft copolymer resin (A) of the examples and comparative examples of the present invention is a core-shell g-ABS copolymer resin having an average particle diameter of 300 μm which is prepared by emulsion graft polymerization of 58 parts by weight of polybutadiene rubber latex, 36 parts by weight of acrylonitrile, and 65 parts by weight of styrene.

[0050] (B) Polymethylmethacrylate (PMMA) Resin

[0051] A polymethylmethacrylate (PMMA) resin having a weight-average molecular weight of 85,000 and including 88 parts by weight of methyl methacrylate monomer and 12 parts by weight of methacrylic acid is used.

[0052] (C) Aromatic Vinyl Copolymer Resin Including a (Meth)Acrylate Alkyl Ester

[0053] A M-SAN resin having a weight-average molecular weight of 80,000 and including 20 parts by weight of methyl methacrylate monomer, 20 parts by weight of acrylonitrile monomer, and 70 parts by weight of styrene monomer is used.

[0054] (D) Methyl Methacrylate-Styrene (MS) Resin

[0055] (d1) MS-300 including 30% by weight methyl methacrylate styrene resin produced by NIPPON STEEL CORPORATION is used.

[0056] (d2) MS-320XL including 20% by weight methyl methacrylate styrene resin produced by NIPPON STEEL CORPORATION is used.

- (A): C08L55/02
- (B): C08L33/12
- (C): C08L25/14

Combination Set: C08L25/14, C08L33/12, C08L55/02

Combination Set: C08L33/12, C08L25/14, C08L55/02

Single symbol Invention: C08L25/14; C08L33/12

Single symbol Additional: C08L2205/03

TABLE 1

	Examples				Comparative Examples		
	1	2	3	4	1	2	3
(A) g-ABS	11	13	15	17	—	15	22
(B) PMMA	35	37	35	43	100	—	—
(C) M-SAN	54	50	50	40	—	—	—
(D) MS (d1)	—	—	—	—	—	85	—
(d2)	—	—	—	—	—	—	78

(unit: wt %)