Patent Literature 3: Japanese Patent Laid-Open No. S61-278578
Patent Literature 4: Japanese Patent Laid-Open No. S61-261310
Patent Literature 5: Japanese Patent Laid-Open No. H05-69874
Patent Literature 6: Japanese Patent Laid-Open No. 2000-309767
Patent Literature 7: Japanese Patent Laid-Open No. 2004-137297
JP 2004-083791 A discloses a method of producing a di-block polymer having an aromatic vinyl block and a diene block, and a tri- and/or tetra-branched copolymer having an aromatic vinyl block and a diene block.

Summary of Invention

Solution to Problem

[0008]

However, the viscous adhesive compositions and adhesive compositions disclosed in Patent Literatures 3 and 4 are insufficient in improvement effect on the above performances. In addition, even the compositions disclosed in Patent Literatures 5, 6 and 7 are still insufficient in performance balance between viscous adhesion characteristics and melting characteristics or coatability.

[0009]

The present invention is thus made in view of the above-described problems in conventional arts, and an object of the present invention is to provide a block copolymer composition to serve as an adhesive composition

being excellent in balance between viscous adhesion performance and melt viscosity and having excellent tack, retention strength, melting characteristics and coatability, and an adhesive composition comprising the block copolymer composition.

Solution to Problem

[0010]

The present inventors diligently studied to solve the above problems, and have found that the above problems can be effectively solved by using two types of block copolymers each having a particular structure, composition and weight average molecular weight, and have completed the present invention.

[0011]

Specifically, the present invention is as follows:

[1]

A block copolymer composition comprising:
50% by mass or more and 90% by mass or less of a component (a), and 10% by mass or more and 50% by mass or less of a component (b), wherein

the component (a) is a block copolymer comprising a polymer block (A) mainly comprising a vinyl aromatic monomer unit and a polymer block (B) mainly comprising a conjugated diene monomer unit, wherein the block copolymer has a weight average molecular weight of 30,000 or higher and 150,000 or lower;

The block copolymer composition according to any one of items [1] to [8], wherein

the component (a) is a block copolymer represented by (A-B) and/or (A-B)X, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator, and

the component (b) is a block copolymer represented by $(A-B)_3X$ and the formula $(A-B)_4X$, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator.

[10]

The block copolymer composition according to any one of items [1] to [8], wherein

the component (a) is a block copolymer represented by (A-B) and/or (A-B)X, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator, and

the component (b) is a block copolymer represented by $(A-B)_2X$, $(A-B)_3X$ and the formula $(A-B)_4X$, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator.

[11]

The block copolymer composition according to any one of items [1] to [10], wherein

a content of the component (a) is 70% by mass or more and 90% by mass or less, and

a content of the component (b) is 10% by mass or more and 30% by mass or less.

[12]

The block copolymer composition according to any one of items [1] to [10], wherein

a content of the component (a) is 50% by mass or more and less than 70% by mass or less, and

a content of the component (b) is more than 30% by mass and 50% by mass or less.

[13]

The copolymer composition according to any one of items [1] to [12], wherein a hydrogenation ratio in the conjugated diene monomer unit in the component (a) and the component (b) is 20% by mass to 70% by mass.

[14]

The copolymer composition according to any one of items [1] to [12], wherein a hydrogenation ratio in the conjugated diene monomer unit in the component (a) and the component (b) is more than 70% by mass.

[15]

A adhesive composition comprising:

100 parts by mass of the block copolymer composition according to any one of items [1] to [14];

50 to 400 parts by mass of a tackifier; and

10 to 200 parts by mass of a softener.

Advantageous Effects of Invention

[0012]

The present invention can provide a block copolymer composition to serve as an adhesive composition being excellent in balance between viscous adhesion performance and melt viscosity and having excellent tack, retention strength, melting characteristics and coatability, and a adhesive composition comprising the block copolymer composition.

Brief Description of Drawings

[0013]

[Figure 1] Figure 1 shows a plot vertically partitioned at an inflection point between peaks for components (b-2) and (b-3).

[Figure 2] Figure 2 shows another plot vertically partitioned at an inflection point between peaks for components (b-2) and (b-3).

[Figure 3] Figure 3 shows a plot vertically partitioned at inflection points between peaks for components (b-1), (b-2) and (b-3).

Description of Embodiments

[0014]

Hereinafter, embodiments of the present invention (hereinafter, referred to as "the present embodiments") will be described in detail. It is to be noted that the present invention is never limited to the following embodiments and can be implemented with various modifications within the scope of the gist.

[0015]

[Block copolymer composition]

A block copolymer composition according to the present embodiments comprises:

50% by mass or more and 90% by mass or less of a component (a), and 10% by mass or more and 50% by mass or less of a component (b), and

The vinyl aromatic hydrocarbon compound constituting the polymer block (A) in the components (a) and (b) is not limited, and examples thereof include alkylstyrenes such as styrene, α-methylstyrene, p-methylstyrene and p-tert-butylstyrene; alkoxystyrenes such as p-methoxystyrene; and vinylnaphthalene. Among them, styrene is preferred for the vinyl aromatic hydrocarbon. One of the vinyl aromatic hydrocarbon compounds may be used singly, or two or more thereof may be used in combination.

[0039]

The conjugated diene compound constituting the polymer block (B) in the components (a) and (b) is not limited as long as the conjugated diene compound is a diolefin having a conjugated double bond, and examples thereof include 1,3-butadiene, 2-methyl-1,3-butadiene (isoprene), 2,3-dimethyl-1,3-butadiene, 1,3-pentadiene, and 1,3-hexadiene. Among them, 1,3-butadiene and isoprene are preferred for the conjugated diene compound. One of the conjugated diene compounds may be used singly, or two or more thereof may be used in combination.

[0040]

[Content of block copolymer]

The content of the component (a) is 50% by mass or more and 90% by mass or less based on the total amount of the block copolymer composition, and the content of the component (b) is 10% by mass or more and 50% by mass or

less based on the total amount of the block copolymer composition. The contents of the components (a) and (b) in the range provide a block copolymer composition and adhesive composition having excellent viscous adhesion characteristics, low melt viscosity characteristics and high softening point characteristics.

[0041]

As one embodiment, the block copolymer compositions listed in the following are preferred:

a block copolymer composition in which the content of the component (a) is 60% by mass or more and 90% by mass or less, and the content of the component (b) is 10% by mass or more and 40% by mass or less;

a block copolymer composition in which the content of the component (a) is 65% by mass or more and 90% by mass or less, and the content of the component (b) is 10% by mass or more and 35% by mass or less;

a block copolymer composition in which the content of the component (a) is 70% by mass or more and 90% by mass or less, and the content of the component (b) is 10% by mass or more and 30% by mass or less;

a block copolymer composition in which the content of the component (a) is 73% by mass or more and 88% by

As another aspect, the block copolymer compositions listed in the following are preferred:

a block copolymer composition in which the content of the component (a) is 50% by mass or more and less than 70% by mass, and the content of the component (b) is more than 30% by mass and 50% by mass or less;

Preferred is a block copolymer composition in which the content of the component (a) having a weight average molecular weight of 30,000 or higher and 150,000 or lower is 50% by mass or more and 90% by mass or less, and the content of the component (b) having a weight average molecular weight of 60,000 or higher and 600,000 or lower is 10% by mass or more and 50% by mass or less. The contents and weight average molecular weights of the components (a) and (b) in the range provide a block copolymer composition and adhesive composition having excellent viscous adhesion characteristics, low melt viscosity characteristics and high softening point characteristics.

[0046]

As one aspect, the block copolymer compositions listed in the following are preferred:

a block copolymer composition in which the content of the component (a) having a weight average molecular weight of 30,000 or higher and 140,000 or lower is 60% by mass or more and 90% by mass or less, and the content of

compositions each obtained by using a hydrogenated block copolymer composition in which a block copolymer composition having one of the above ranges of content and weight average molecular weight has been hydrogenated are excellent in retention strength, thermal stability, and odor control at higher temperatures, and, for example, suitable for a portion for which a high cohesive force is required, such as a waist gather of a disposable diaper, and production processes which are likely to require prolonged residence of an adhesive composition in a processor/coater.

[0048]

As another aspect, the block copolymer compositions listed in the following are preferred:

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a block copolymer composition in which the content of the component (a) having a weight average molecular weight of 60,000 or higher and 120,000 or lower is 50% by mass or more and 70% by mass or less, and the content of the component (b) having a weight average molecular weight of 100,000 or higher and 350,000 or lower is 30% by mass or more and 50% by mass or less;

a block copolymer composition in which the content of the component (a) having a weight average molecular weight of 60,000 or higher and 120,000 or lower is 53% by mass or more and 68% by mass or less, and the content of the component (b) having a weight average molecular weight of 200,000 or higher and 350,000 or lower is 32% by mass or more and 47% by mass or less; and

a block copolymer composition in which the content of the component (a) having a weight average molecular weight of 60,000 or higher and 120,000 or lower is 53% by

To the block copolymer composition obtained, the hydrogenation catalyst prepared in a manner as described above was further added in an amount of 50 ppm in terms of Ti per 100 parts by mass of the block copolymer, and the resultant was allowed to undergo a hydrogenation reaction at a hydrogen pressure of 0.8 MPa and an average temperature of 86°C. The hydrogenation ratio of the block copolymer composition obtained was 40.9% by mass.

[0385]

To the block copolymer solution obtained, octadecyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate was added in an amount of 0.3 parts by mass based on 100 parts by mass of the block copolymer, and the solution was thoroughly stirred. The solvent was then removed by heating to obtain a block copolymer composition 30.

[0386]

With regard to the block copolymer composition 30 obtained, the content of the vinyl aromatic monomer unit was 16.1% by mass, the average vinyl bond content in the conjugated diene monomer unit was 29.5% by mass, and the viscosity in a 15% by mass toluene solution was 187.9 mPa·s.

[0387]

Other physical property values of the block copolymer composition 30 obtained are shown in Table 4.

[0388]

[Examples 1 to 38 (Example 35 is a reference example), Comparative Examples 1 to 22]

[Table 10]

		Example									Comparative Example			
		30	31	32	33	34	35**	36	37	38	19	20	21	22
Block copolymer composition	Component	25	28	29	30	25	27	28	28	29	3433	11	23	9
	Amount blended (parts by mass)	100	100	100	100	50	50	50	50	75	100	100	100	50
	Component	-	-	-	-	9	10	D1161	Q3433N	S2063	-	-	-	Q3433N
	Amount blended (parts by mass)	-	-	-	-	50	50	50	50	25	-	-	-	50
Tackifier 2 (parts by mass)		200	200	200	200	200	140	200	200	200	200	200	200	200
Softener 2 (parts by mass)		100	100	100	100	100	30	100	100	100	100	100	100	100
Melting characteristics		○	○	○	○	○	○	○	○	○	○	×	○	○
Melt viscosity at 180°C (mPa·s)		2,410	2,780	2,930	2,860	1,790	3,680	2,970	2,250	2,380	1,790	2,850	790	1,320
Softening point (°C)		84	91	95	98	87	109	86	84	92	83	96	87	88
Coatability		○	○	○	○	○	○	○	○	○	○	×	○	○
Tacking characteristics; adherend SUS304	Tackiness (probe tack) (N/5 mmϕ.)	1.9	2.2	2.6	2.3	1.7	1.6	1.9	2	2.1	1.7	0	0	0.9
	Retention strength at 50°C (min)	15	19	25	38	18	26	19	14	17	7	11	3	5
Retention strength at 50°C / Melt viscosity at 180°C × 100 (-)		0.62	0.68	0.85	1.33	1	0.71	0.64	0.62	0.71	0.39	0.39	0.38	0.38
Light resistance	Tack strength change rate (%)	○	○	○	○	○	○	○	○	○	×	×	×	×
	Adhesion residue on adherend	○	○	○	○	○	○	○	○	○	×	×	×	×

*D1161: Kraton D1161 (manufactured by Kraton Performance Polymers, Inc.)

*Q3433N: Quintac 3433N (manufactured by Zeon Corporation)

*S2063: SEPTON 2063 (manufactured by KURARAY CO., LTD.)

** for reference, not belonging to the invention

[0399]

It was found that any of the adhesive compositions in Examples 1 to 10 and 15 to 17 had good viscous adhesive characteristics including loop tack (tackiness), tack strength and retention strength at 40°C, and was excellent in performance balance between melt viscosity and retention strength at 40°C. Further, it was found that any of the adhesive compositions in Examples 11 to 14 and 18 to 20 had good retention strength at 60°C and thermal stability in addition to the above performance, and was excellent in performance balance between melt viscosity and retention strength at 40°C.

[0400]

It was found that any of the adhesive compositions in Examples 21 to 29 had good viscous adhesive characteristics including ball tack (tackiness) and retention strength at 50°C, and was excellent in performance balance between melt viscosity and retention strength at 50°C, and light resistance.

[0401]

It was found that any of the adhesive compositions in Examples 30 to 38 (Example 35 for reference only) had good viscous adhesive characteristics including probe tack (tackiness) and retention strength at 50°C, and was excellent in performance balance between melt viscosity and retention strength at 50°C, and light resistance.

[0402]

Industrial Applicability

[0403]

The adhesive composition according to the present invention can be used for various pressure-sensitive adhesive tapes, pressure-sensitive adhesive sheets, pressure-sensitive adhesive films, pressure-sensitive adhesive labels, pressure-sensitive thin plates, pressure-sensitive sheets, surface-protective sheets, surface-protective films, hygiene products, back adhesives for fixing various lightweight plastic molded articles, back adhesives for fixing a carpet, back adhesives for fixing a tile, adhesives or the like, and in particular has industrial applicability as a viscous adhesive for pressure-sensitive adhesive tapes, pressure-sensitive adhesive sheets, pressure-sensitive adhesive films, pressure-sensitive adhesive labels, surface-protective sheets, surface-protective films and hygiene products.

Claims

[Claim 1]

A block copolymer composition comprising:
50% by mass or more and 90% by mass or less of a component (a), and 10% by mass or more and 50% by mass or less of a component (b), wherein

the component (a) is a block copolymer comprising a polymer block (A) mainly comprising a vinyl aromatic monomer unit and a polymer block (B) mainly comprising a conjugated diene monomer unit, wherein the block copolymer has a weight average molecular weight of 30,000 or higher and 150,000 or lower;

the component (b) is a block copolymer comprising a polymer block (A) mainly comprising a vinyl aromatic monomer unit and a polymer block (B) mainly comprising a conjugated diene monomer unit;

the component (b) comprises a component (b-2) at a ratio of weight average molecular weight to the weight average molecular weight of the component (a) of 2.5 or more and less than 3.4, and a component (b-3) at a ratio of weight average molecular weight to the weight average molecular weight of the component (a) of 3.4 or more and less than 4.5; and

a content of the vinyl aromatic monomer unit in the component (a) and the component (b) is 10 to 50% by mass

The block copolymer composition according to any one of claims 1 to 8, wherein

the component (a) is a block copolymer represented by (A-B) and/or (A-B)X, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator, and

the component (b) is a block copolymer represented by $(A-B)_2X$, $(A-B)_3X$ and the formula $(A-B)_4X$, wherein A denotes a polymer block (A); B denotes a polymer block (B); and X denotes a residue of a coupling agent or a residue of a polymerization initiator.

[Claim 11]

The block copolymer composition according to any one of claims 1 to 10, wherein

a content of the component (a) is 70% by mass or more and 90% by mass or less, and

a content of the component (b) is 10% by mass or more and 30% by mass or less.

[Claim 12]

The block copolymer composition according to any one of claims 1 to 10, wherein

a content of the component (a) is 50% by mass or more and less than 70%, and

a content of the component (b) is more than 30% by mass and 50% by mass or less.

[Claim 13]

The copolymer composition according to any one of claims 1 to 12, wherein a hydrogenation ratio in the conjugated diene monomer unit in the component (a) and the component (b) is 20% by mass to 70% by mass.

[Claim 14]

The copolymer composition according to any one of claims 1 to 12, wherein a hydrogenation ratio in the conjugated diene monomer unit in the component (a) and the component (b) is more than 70% by mass.

[Claim 15]

An adhesive composition comprising:

100 parts by mass of the block copolymer composition according to any one of claims 1 to 14;