

Claims

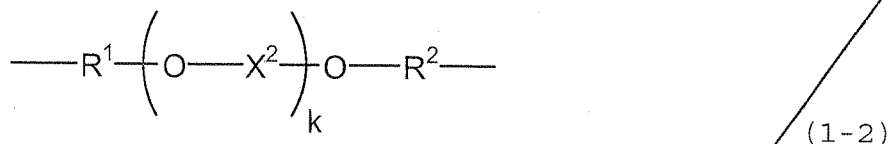
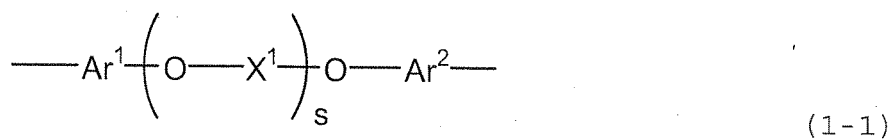
1. A film comprising a composition obtained by mixing:
a compound at least having a ring structure containing one carbodiimide group, with the first nitrogen and second nitrogen thereof being linked together through a linking group; with
a polymer compound having an acidic group.
2. The film according to claim 1, wherein in the compound at least having a ring structure, the number of atoms forming the ring structure is 8 to 50.
3. The film according to claim 1, wherein the ring structure is represented by the following formula (1):



wherein Q is a divalent to tetravalent linking group that is an aliphatic group, an alicyclic group, an aromatic group, or a combination thereof and optionally contains a heteroatom.

4. The film according to claim 3, wherein Q is a divalent to tetravalent linking group represented by the following

formula (1-1), (1-2), or (1-3):



wherein

Ar¹ and Ar² are each independently a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

R¹ and R² are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a combination thereof, or a combination of the aliphatic or alicyclic group with a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

X¹ and X² are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

s is an integer of 0 to 10 and k is an integer of 0 to 10, with the proviso that when s or k is 2 or more, X¹ or X² as a repeating unit may be different from the other X¹ or X², and

X³ is a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

with the proviso that

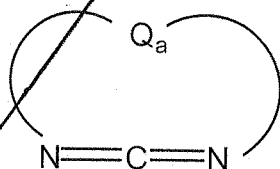
Ar¹, Ar², R¹, R², X¹, X², and X³ optionally contain a heteroatom,

when Q is a divalent linking group, Ar¹, Ar², R¹, R², X¹, X², and X³ are all divalent groups,

when Q is a trivalent linking group, one of Ar¹, Ar², R¹, R², X¹, X², and X³ is a trivalent group, and

when Q is a tetravalent linking group, one of Ar¹, Ar², R¹, R², X¹, X², and X³ is a tetravalent group or two of Ar¹, Ar², R¹, R², X¹, X², and X³ are trivalent groups.

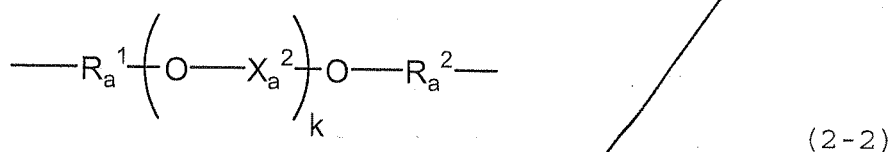
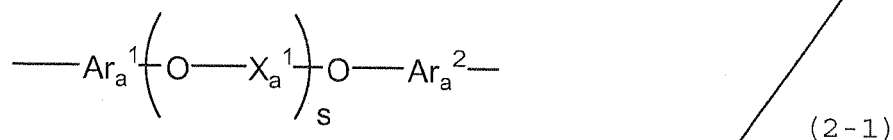
5. The film according to claim 4, wherein the compound having a ring structure is represented by the following formula (2):



(2)

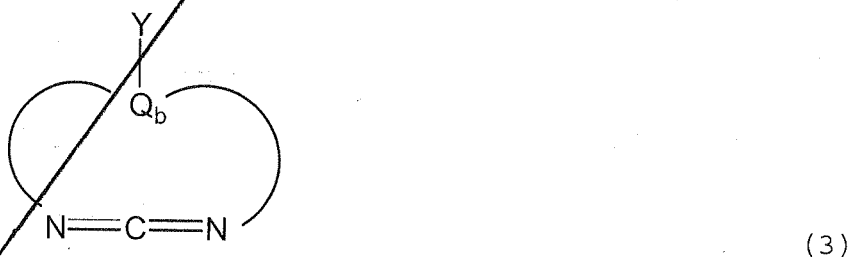
wherein Q_a is a divalent linking group that is an aliphatic group, an alicyclic group, an aromatic group, or a combination thereof and optionally contains a heteroatom.

6. The film according to claim 5, wherein Qa is a divalent linking group represented by the following formula (2-1), (2-2), or (2-3):



wherein Ar_a^1 , Ar_a^2 , R_a^1 , R_a^2 , X_a^1 , X_a^2 , X_a^3 , s , and k are as defined for Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , X^3 , s , and k of formulae (1-1) to (1-3), respectively.

7. The film according to claim 1, wherein the compound having a ring structure is represented by the following formula (3):



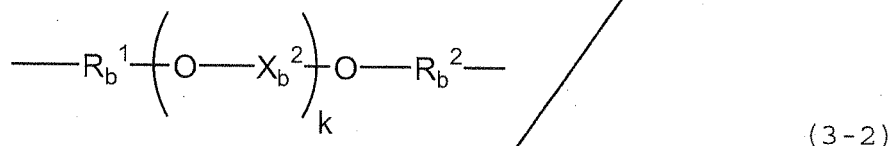
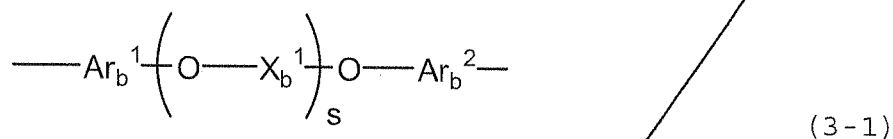
wherein

Q_b is a trivalent linking group that is an aliphatic group, an alicyclic group, an aromatic group, or a combination thereof and optionally contains a heteroatom,

and

Y is a carrier that supports the ring structure.

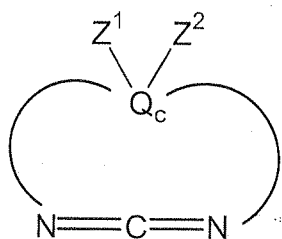
8. The film according to claim 7, wherein Q_b is a trivalent linking group represented by the following formula (3-1), (3-2), or (3-3):



wherein Ar_b^1 , Ar_b^2 , R_b^1 , R_b^2 , X_b^1 , X_b^2 , X_b^3 , s , and k are as defined for Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , X^3 , s , and k of formulae (1-1) to (1-3), respectively, with the proviso that one of the groups is a trivalent group.

9. The film according to claim 7, wherein Y is a single bond, a double bond, an atom, an atomic group, or a polymer.

10. The film according to claim 1, wherein the compound having a ring structure is represented by the following formula (4):



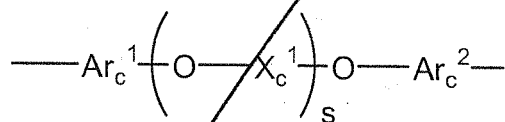
(4)

wherein

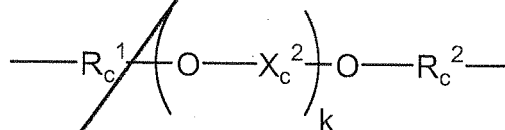
Q_c is a tetravalent linking group that is an aliphatic group, an aromatic group, an alicyclic group, or a combination thereof and optionally contains a heteroatom, and

Z^1 and Z^2 are carriers that support the ring structure.

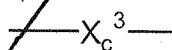
11. The film according to claim 10, wherein Q_c is a tetravalent linking group represented by the following formula (4-1), (4-2), or (4-3):



(4-1)



(4-2)



(4-3)

wherein Ar_c^1 , Ar_c^2 , R_c^1 , R_c^2 , X_c^1 , X_c^2 , X_c^3 , s , and k are as defined for Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , X^3 , s , and k of formulae (1-1) to (1-3), respectively, with the proviso that one of the groups is a tetravalent group or two of

the groups are trivalent groups.

12. The film according to claim 10, wherein Z^1 and Z^2 are each independently a single bond, a double bond, an atom, an atomic group, or a polymer.

13. The film according to claim 1, wherein the polymer compound having an acidic group is at least one member selected from the group consisting of aromatic polyesters, aliphatic polyesters, polyamides, polyamide polyimides, and polyester amides.

14. The film according to claim 13, wherein the aromatic polyester contains as a main repeating unit at least one member selected from the group consisting of butylene terephthalate, ethylene terephthalate, trimethylene terephthalate, ethylene naphthalene dicarboxylate, and butylene naphthalene dicarboxylate.

15. The film according to claim 13, wherein the aliphatic polyester is polylactic acid.

16. The film according to claim 15, wherein the polylactic acid forms a stereocomplex crystal.

Claims

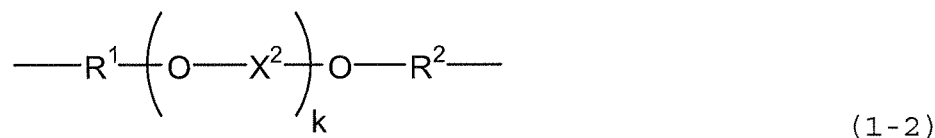
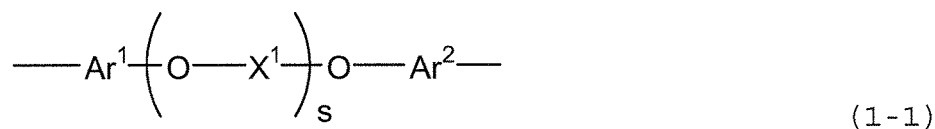
1. A film comprising a composition obtained by mixing:
a compound at least having a ring structure containing one carbodiimide group, with the first nitrogen and second nitrogen thereof being linked together through a linking group; with

a polymer compound having an acidic group,

wherein in the compound at least having a ring structure, the number of atoms forming the ring structure is 8 to 50, and the ring structure is represented by the following formula (1):



wherein Q is a divalent to tetravalent linking group represented by the following formula (1-1), (1-2), or (1-3):



wherein

Ar¹ and Ar² are each independently a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

R^1 and R^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a combination thereof, or a combination of the aliphatic or alicyclic group with a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

X^1 and X^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

s is an integer of 0 to 10 and k is an integer of 0 to 10, with the proviso that when s or k is 2 or more, X^1 or X^2 as a repeating unit may be different from the other X^1 or X^2 , and

X^3 is a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

with the proviso that

Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , and X^3 optionally contain a heteroatom,

when Q is a divalent linking group, Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , and X^3 are all divalent groups,

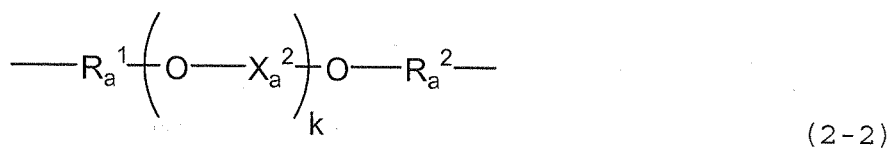
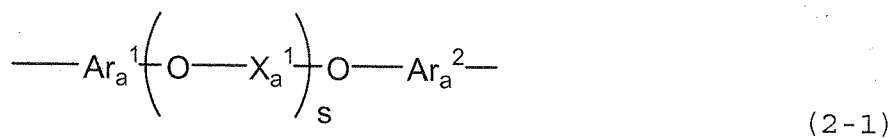
when Q is a trivalent linking group, one of Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , and X^3 is a trivalent group, and

when Q is a tetravalent linking group, one of Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , and X^3 is a tetravalent group or two of Ar^1 , Ar^2 , R^1 , R^2 , X^1 , X^2 , and X^3 are trivalent groups.

2. The film according to claim 1, wherein the compound having a ring structure is represented by the following formula (2):



wherein Q_a is a divalent linking group represented by the following formula (2-1), (2-2), or (2-3):



wherein

Ar_a^1 and Ar_a^2 are each independently a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

R_a^1 and R_a^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a combination thereof, or a combination of the aliphatic or alicyclic group with a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

X_a^1 and X_a^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof, s is an integer of 0 to 10 and k is an integer of 0 to 10, with the proviso that when s or k is 2 or more, X_a^1 or X_a^2 as a repeating unit may be different from the other X_a^1 or X_a^2 ,

X_a^3 is a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

with the proviso that

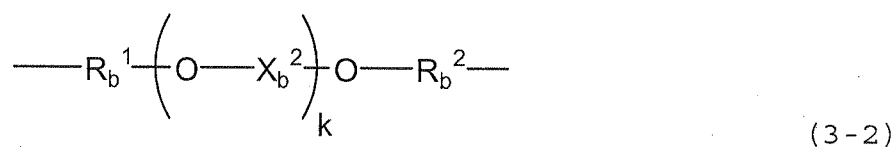
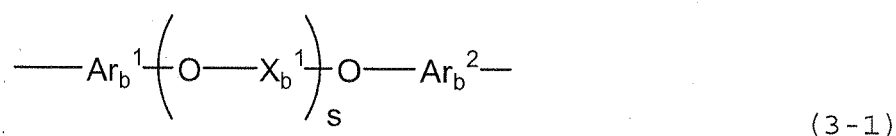
Ar_a^1 , Ar_a^2 , R_a^1 , R_a^2 , X_a^1 , X_a^2 and X_a^3 optionally contain a heteroatom.

3. The film according to claim 1, wherein the compound having a ring structure is represented by the following formula (3):



wherein

Q_b is a trivalent linking group represented by the following formula (3-1), (3-2), or (3-3):



wherein

Ar_b^1 and Ar_b^2 are each independently a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

R_b^1 and R_b^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a combination thereof, or a combination of the aliphatic or alicyclic group with a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

X_b^1 and X_b^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof, s is an integer of 0 to 10 and k is an integer of 0 to 10, with the proviso that when s or k is 2 or more, X_b^1 or X_b^2 as a repeating unit may be different from the other X_b^1 or X_b^2 ,

X_b^3 is a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

with the proviso that

Ar_b^1 , Ar_b^2 , R_b^1 , R_b^2 , X_b^1 , X_b^2 and X_b^3 optionally contain a heteroatom,

and,

one of Ar_b^1 , Ar_b^2 , R_b^1 , R_b^2 , X_b^1 , X_b^2 and X_b^3 is a trivalent group.

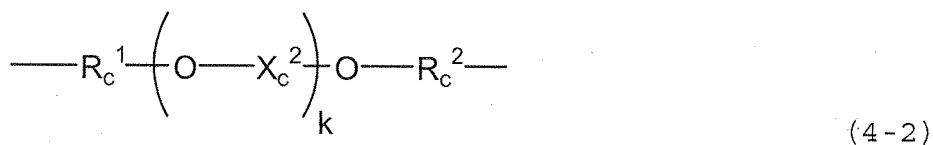
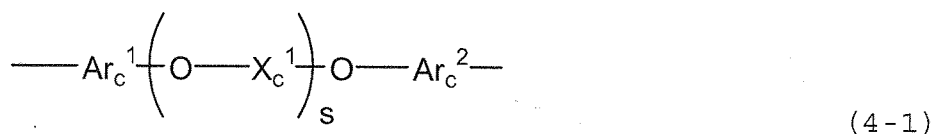
4. The film according to claim 3, wherein Y is a single bond, a double bond, an atom, an atomic group, or a polymer.

5. The film according to claim 1, wherein the compound having a ring structure is represented by the following formula (4):



Wherein

Q_c is a tetravalent linking group represented by the following formula (4-1), (4-2), or (4-3):



wherein

Ar_c^1 and Ar_c^2 are each independently a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

R_c^1 and R_c^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a combination thereof, or a combination of the aliphatic or alicyclic group with a divalent to tetravalent aromatic group having 5 to 15 carbon atoms,

X_c^1 and X_c^2 are each independently a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof, s is an integer of 0 to 10 and k is an integer of 0 to 10, with the proviso that when s or k is 2 or more, X_c^1 or X_c^2 as a repeating unit may be different from the other X_c^1 or X_c^2 ,

X_c^3 is a divalent to tetravalent aliphatic group having 1 to 20 carbon atoms, a divalent to tetravalent alicyclic group having 3 to 20 carbon atoms, a divalent to tetravalent aromatic group having 5 to 15 carbon atoms, or a combination thereof,

with the proviso that

Ar_c^1 , Ar_c^2 , R_c^1 , R_c^2 , X_c^1 , X_c^2 and X_c^3 optionally contain a heteroatom,

and,

one of Ar_c^1 , Ar_c^2 , R_c^1 , R_c^2 , X_c^1 , X_c^2 and X_c^3 is a tetravalent group or two of Ar_c^1 , Ar_c^2 , R_c^1 , R_c^2 , X_c^1 , X_c^2 and X_c^3 are trivalent groups.

6. The film according to claim 5, wherein Z^1 and Z^2 are each independently a single bond, a double bond, an atom, an atomic group, or a polymer.

7. The film according to claim 1, wherein the polymer compound having an acidic group is at least one member selected from the group consisting of aromatic polyesters, aliphatic polyesters, polyamides, polyamide polyimides, and polyester amides.

8. The film according to claim 7, wherein the aromatic polyester contains as a main repeating unit at least one member selected from the group consisting of butylene terephthalate, ethylene terephthalate, trimethylene terephthalate, ethylene naphthalene dicarboxylate, and butylene naphthalene dicarboxylate.

9. The film according to claim 7, wherein the aliphatic polyester is polylactic acid.

10. The film according to claim 9, wherein the polylactic acid forms a stereocomplex crystal.