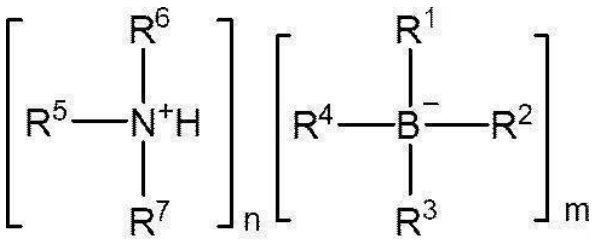
[CLAIMS]

1. A compound represented by the following formula (1):



(1)

wherein

R^1, R^2, R^3, and R^4 are each independently a C_{6-14} aryl group substituted by one or more fluorine atoms or one or more fluoro C_{1-4} alkyl groups,

R^5 is a fluoro C_{1-6} alkyl group,

R^6 and R^7 are each independently a C_{1-30} alkyl group optionally substituted by substituent(s) selected from the group consisting of

(1) a halogen atom, and

(2) a C_{1-30} alkoxy group; or

a C_{3-8} cycloalkyl group optionally substituted by substituent(s) selected from the group consisting of

(1) a halogen atom,

(2) a C_{1-30} alkyl group,

(3) a C_{1-30} alkoxy group,

(4) a halo C_{1-30} alkyl group, and

(5) a halo C_{1-30} alkoxy group,

n is 1,

m is 1 or 2, and

a total carbon number of R^5, R^6, and R^7 is not less than 25.

2. The compound according to claim 1, wherein R^1, R^2, R^3, and R^4 are each independently a phenyl group, a 1-naphthyl group, a 2-naphthyl group, a 2-biphenylyl group, a 3-biphenylyl group, a

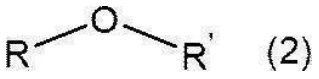
4-biphenylyl group, a 1-anthryl group, a 2-anthryl group, a 9-anthryl group, a 9-phenanthryl group, or a 3-phenanthryl group, each of which is substituted by one or more fluorine atoms or one or more fluoro C_{1-4} alkyl groups.

3. The compound according to claim 1, wherein all of R^1, R^2, R^3, and R^4 are pentafluorophenyl groups, 2,2',3,3',4',5,5',6,6'-nonafluoro-4-(1,1'-biphenylyl) groups, 2,3,4,5,6,7,8-heptafluoro-1-naphthyl groups, or 1,3,4,5,6,7,8-heptafluoro-2-naphthyl groups.

4. The compound according to any one of claims 1 to 3, wherein
R^5 is a fluoro C_{1-6} alkyl group,
R^6 and R^7 are each independently a C_{1-30} alkyl group optionally substituted by substituent(s) selected from the group consisting of
(1) a halogen atom, and
(2) a C_{1-30} alkoxy group.

5. The compound according to any one of claims 1 to 4, wherein n and m are each 1.

6. A composition comprising the compound according to any one of claims 1 to 5, and a compound of the following formula (2):



(2)

wherein
R and R' are each independently an optionally substituted C_{1-30} alkyl group, an optionally substituted C_{3-15} cycloalkyl group, or an optionally substituted C_{6-14} aryl group.

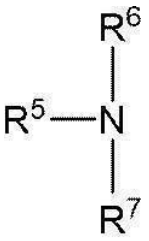
7. The composition according to claim 6, wherein R and R' are

each independently an optionally substituted C_{1-30} alkyl group.

8. The composition according to claim 6 or 7, wherein a content of the compound represented by the formula (2) with respect to 1 mol of the compound represented by the formula (1) is 0.01 to 10 mol.

9. The composition according to claim 6 or 7, wherein a content of the compound represented by the formula (2) with respect to 1 mol of the compound represented by the formula (1) is 0.1 to 3 mol.

10. A composition comprising the compound according to any one of claims 1 to 5, and a compound of the following formula (3):



(3)

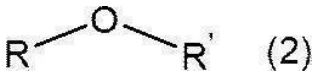
wherein R^5, R^6, and R^7 are as defined above
(in the composition, the compound represented by the formula (3) is an amine compound deprotonated from the cation constituting the formula (1) according to claim 1).

11. The composition according to claim 10, wherein a content of the compound represented by the formula (3) with respect to 1 mol of the compound represented by the formula (1) is 0.01 to 10 mol.

12. The composition according to claim 10, wherein a content of the compound represented by the formula (3) with respect to 1

mol of the compound represented by the formula (1) is 0.5 to 3 mol.

13. The composition according to any one of claims 10 to 12, further comprising a compound represented by the following formula (2):



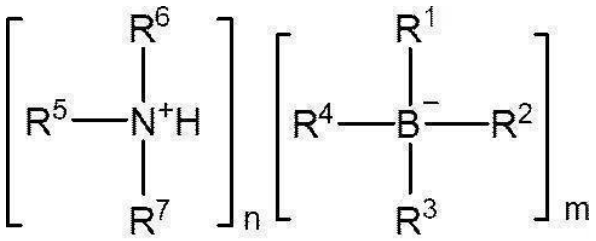
(2)

wherein
R and R' are each independently an optionally substituted C_{1-30} alkyl group, an optionally substituted C_{3-15} cycloalkyl group, or an optionally substituted C_{6-14} aryl group.

14. A co-catalyst for polymerizing at least one monomer selected from the group consisting of olefin, diene, and acetylene, comprising the compound according to any one of claims 1 to 5, or the composition according to any one of claims 6 to 13.

15. A method for producing a polymer, comprising polymerizing at least one kind of monomer selected from the group consisting of olefin, diene and acetylene by using the compound according to any one of claims 1 to 5 or the composition according to any one of claims 6 to 13 as a co-catalyst.

16. A method for producing a compound represented by the following formula (1):



(1)

wherein

R^1, R^2, R^3, and R^4 are each independently a C_{6-14} aryl group substituted by one or more fluorine atoms or one or more fluoro C_{1-4} alkyl groups,

R^5 is a fluoro C_{1-6} alkyl group,

R^6 and R^7 are each independently a C_{1-30} alkyl group optionally substituted by substituent(s) selected from the group consisting of

(1) a halogen atom, and

(2) a C_{1-30} alkoxy group; or

a C_{3-8} cycloalkyl group optionally substituted by substituent(s) selected from the group consisting of

(1) a halogen atom,

(2) a C_{1-30} alkyl group,

(3) a C_{1-30} alkoxy group,

(4) a halo C_{1-30} alkyl group, and

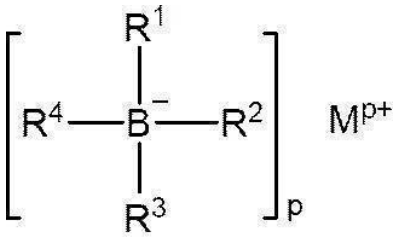
(5) a halo C_{1-30} alkoxy group,

n is 1,

m is 1 or 2, and

a total carbon number of R^5, R^6, and R^7 is not less than 25,

the method comprising a step of reacting, in the presence of a protic acid, a compound represented by the following formula (4):



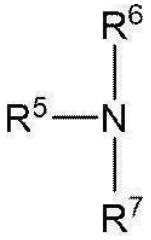
(4)

wherein

R^1, R^2, R^3, and R^4 are as defined above,

M^{p+} is an alkali metal ion or an alkaline earth metal ion, and p is 1 or 2,

with a compound represented by the following formula (3):



(3)

wherein R^5, R^6 and R^7 are as defined above.