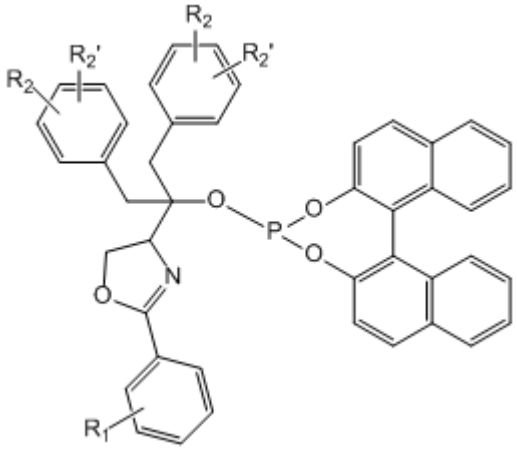
CLAIMS

1. A catalyst for asymmetric hydrogenation of a carbon-carbon double bond-containing compound, comprising:

an iridium cation; and

a ligand of the following Formula 1, which is bonded to the iridium cation

[Formula 1]



wherein

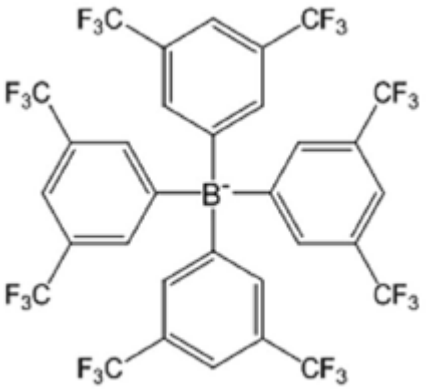
R_1 is a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group;

R_2 and R_2' are each independently a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group; and

the substituent in the substituted alkyl group and substituted alkoxy group is a halogen atom, a straight or branched C_1-C_3 alkyl group, or a straight or branched C_1-C_3 alkoxy group, and

wherein the catalyst further comprises a coordination anion of the following Formula 4:

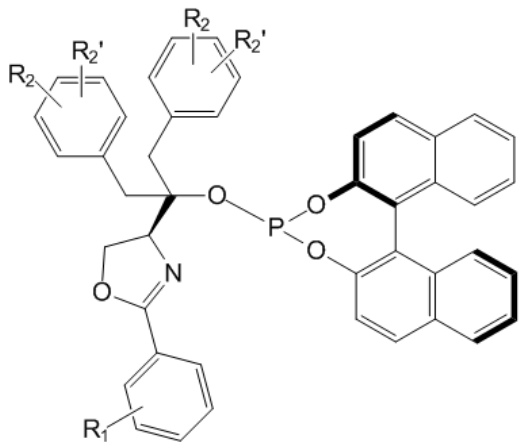
[Formula 4]



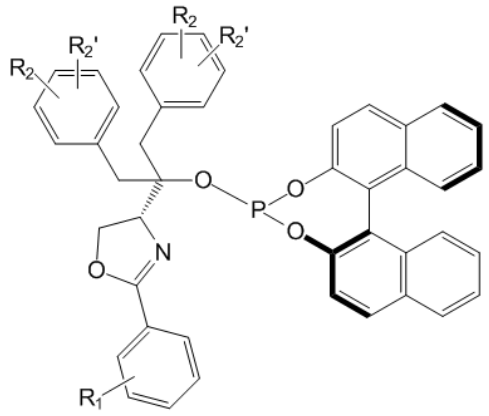
.

2. The catalyst of claim 1, wherein the ligand of Formula 1 is an enantiomeric compound represented by the following Formula 2a or 2b:

[Formula 2a]



[Formula 2b]



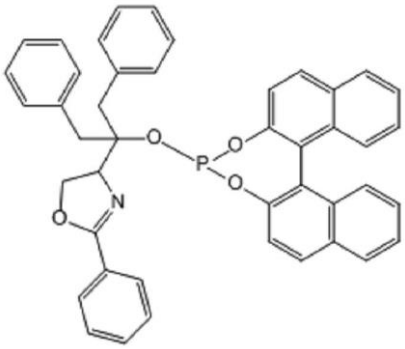
wherein

R_1 is a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group;

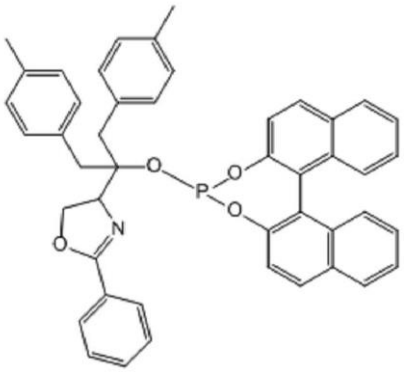
R_2 and R_2' are each independently a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group; and

the substituent in the substituted alkyl group and substituted alkoxy group is a halogen atom, a straight or branched C_1-C_3 alkyl group, or a straight or branched C_1-C_3 alkoxy group.

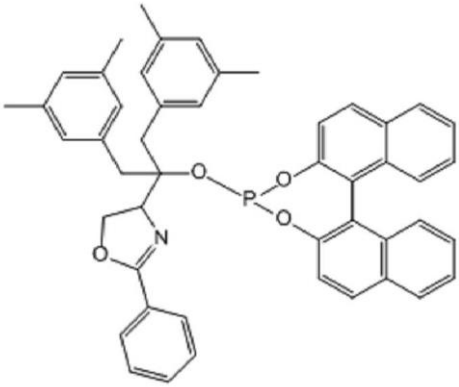
3. The catalyst of claim 1, wherein the ligand of Formula 1 is any one of the following compounds:



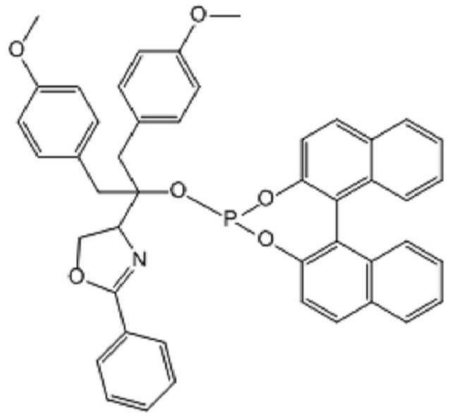
<Compound 1-1>



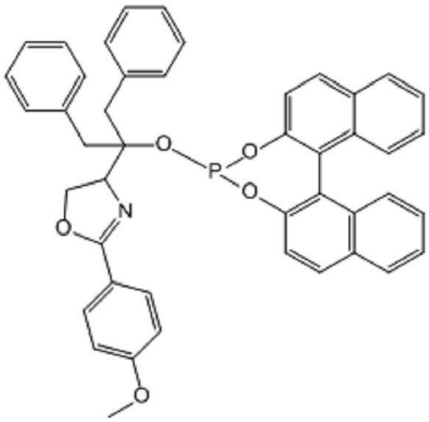
<Compound 1-2>



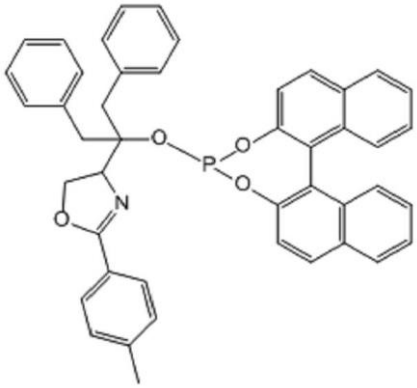
<Compound 1-3>



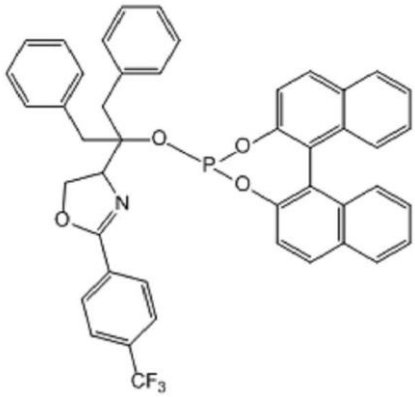
<Compound 1-4>



<Compound 1-5>



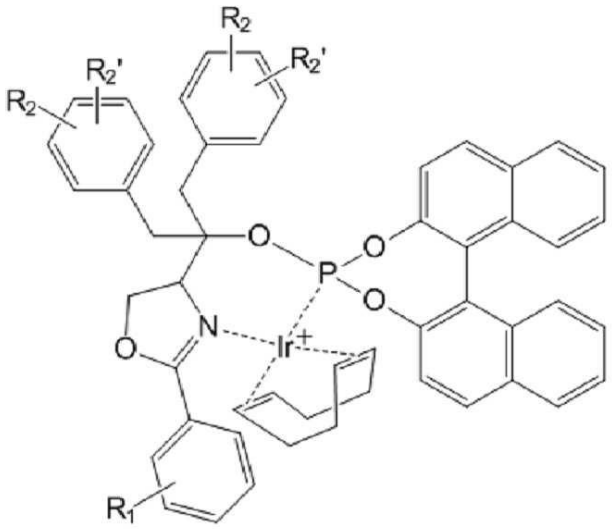
<Compound 1-6>



<Compound 1-7>

4. The catalyst of claim 1, wherein the catalyst comprises a complex of the following Formula 3:

[Formula 3]



wherein

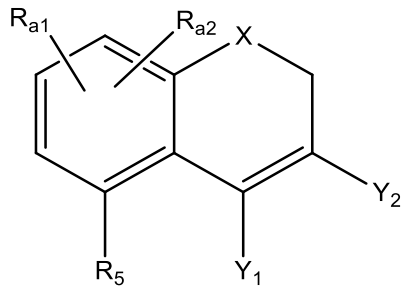
R_1 is a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group;

R_2 and R_2' are each independently a hydrogen atom, a substituted or unsubstituted, straight or branched C_1-C_3 alkyl group, or a substituted or unsubstituted, straight or branched C_1-C_3 alkoxy group; and

the substituent in the substituted alkyl group and substituted alkoxy group is a halogen atom, a straight or branched C_1-C_3 alkyl group, or a straight or branched C_1-C_3 alkoxy group.

5. The catalyst of claim 1, wherein the carbon-carbon double bond-containing compound is represented by the following Formula 6:

[Formula 6]



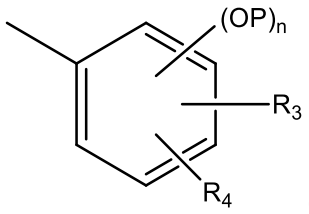
wherein

X is oxygen (O) or carbon (C);

R_{a1} and R_{a2} are each independently a hydrogen atom, a substituted or unsubstituted alkyl group having 1 to 3 carbon atoms, a substituted or unsubstituted alkoxy group having 1 to 3 carbon atoms, or a substituted or unsubstituted aryloxy group or aralkyloxy group having 6 to 15 carbon atoms, or

R_{a1} and R_{a2} together form a substituted or unsubstituted cyclic or heterocyclic group having 4 to 10 carbon atoms;

R_5 is a hydrogen atom or a C_1-C_2 alkyl group or a C_1-C_2 alkoxy group;

Y_1 and Y_2 are different from each other and are each independently a hydrogen atom, a substituted alkyl group having 1 to 3 carbon atoms, a substituted alkoxy group having 1 to 3 carbon atoms, or a 

group,

wherein

R_3 and R_4 are each independently a hydroxyl group, a substituted or unsubstituted, straight or branched C_1-C_6 alkyl

group, a halogen atom, a substituted or unsubstituted, straight or branched C_1-C_6 alkoxy group, a substituted or unsubstituted, straight or branched C_1-C_4 thioalkyl group, a substituted or unsubstituted allyloxy group, or a substituted or unsubstituted aryloxy group;

P represents a protecting group of a substituted or unsubstituted, straight or branched C_1-C_4 alkyl group, a substituted or unsubstituted benzyl group, a substituted or unsubstituted allyl group, a t-butyldimethylsilyl group, t-butyldiphenylsilyl group, a methylphenylsilyl group, a trimethylphenylsilyl group, $MeSO_2$, or p-$TsSO_2$;

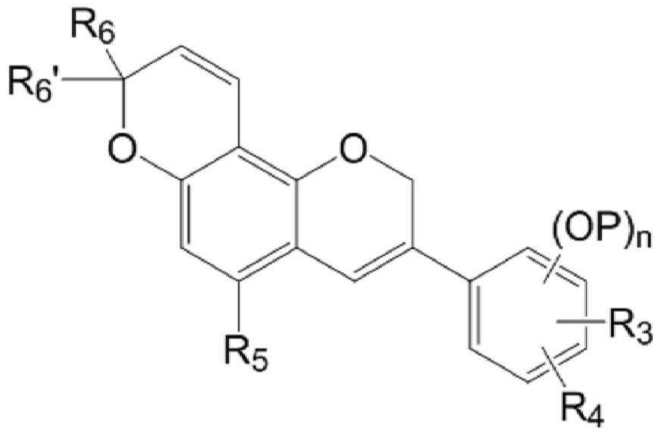
n is 1 to 3;

when OP is plural in number, they are the same or different; and

the substituent in the substituted alkyl group, substituted alkoxy group, substituted thioalkyl group, substituted aryloxy group, substituted aralkyloxy group, substituted cyclic group and substituted heterocyclic group is a halogen atom, a straight or branched C_1-C_5 alkyl group, a straight or branched C_1-C_5 alkoxy group, or a straight or branched C_1-C_3 thioalkyl group.

6. The catalyst of claim 5, wherein the carbon-carbon double bond-containing compound is a compound represented by the following Formula 7:

[Formula 7]



wherein

R_3 and R_4 are each independently a hydrogen atom, a hydroxyl group, a substituted or unsubstituted, straight or branched C_1-C_6 alkyl group, a halogen atom, a substituted or unsubstituted, straight or branched C_1-C_6 alkoxy group; a substituted or unsubstituted, straight or branched C_1-C_4 thioalkyl group; a substituted or unsubstituted allyloxy group, or a substituted or unsubstituted aryloxy group;

R_5 is a hydrogen atom, a C_1-C_2 alkyl group or a C_1-C_2 alkoxy group;

R_6 and R_6' are each independently a hydrogen atom or a C_1-C_6 alkyl group;

P represents a protecting group of a substituted or unsubstituted, straight or branched C_1-C_4 alkyl group, a substituted or unsubstituted benzyl group, a substituted or unsubstituted allyl group, a t-butyldimethylsilyl group, t-butyldiphenylsilyl group, a methylphenylsilyl group, a trimethylphenylsilyl group, $MeSO_2$, or p-$TsSO_2$;

n is 1 to 3;

when OP is plural in number, they are the same or different; and

the substituent in the substituted alkyl group, substituted alkoxy group and substituted thioalkyl group is a halogen atom, a straight or branched C_1-C_5 alkyl group, a straight or branched C_1-C_5 alkoxy group, or a straight or branched C_1-C_3 thioalkyl group.