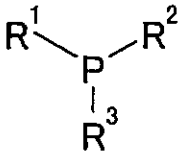
CLAIMS

1. A process for producing an N-(hetero)arylazole, which comprises reacting a (hetero)aryl (pseudo)halide with an NH-azole in the presence of: a catalyst comprising a palladium compound and a coordination compound; and a basic magnesium compound.

2. The process according to claim 1, wherein the coordination compound is at least one compound selected from the group consisting of:

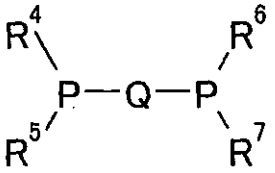
monophosphines represented by the following general formula (1)



(1)

wherein P represents a phosphorus atom, R^1 and R^2 each independently represents an alkyl group, and R^3 represents a hydrocarbyl group which may have a substituent, a heteroaryl group which may have a substituent or a ferrocenyl group which may have a substituent;

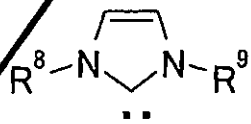
diphosphines represented by the following general formula (2)



(2)

wherein P represents a phosphorus atom, R^4 to R^7 each independently represents an alkyl group, or an aryl group which may have a substituent, and Q represents a divalent group which may have a substituent;

(benzo)imidazol-ylidenes represented by the following general formula (3-1) or (3-2)



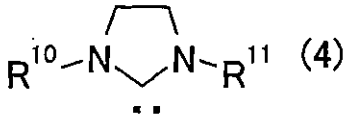
(3-1)



(3-2)

wherein N represents a nitrogen atom, R^8 and R^9 each independently represents an alkyl group; and

imidazolidin-ylidenes represented by the following general formula (4)



(4)

wherein N represents a nitrogen atom, and R^{10} and R^{11} each independently represents an alkyl group or an aryl group.

3. The process according to claim 1 or 2, wherein the (hetero)aryl (pseudo)halide is a compound represented by the following general formula (5)

$$(Het)Ar—X_n \quad (5)$$

wherein (Het)Ar represents an aromatic ring group which may have a substituent or a heteroaromatic ring group which may have a substituent, X represents a (pseudo)halogeno group, a subscript n of X represents the number of the substituent X into (Het)Ar, and is an integer of from 1 to 7.

4. The process according to claim 3, wherein X in the compound represented by the general formula (5) is a chloro group, a bromo group or a (halo)alkanesulfonyloxy group or an arenesulfonyloxy group, and n is an integer of from 1 to 3.

5. The process according to any one of claims 1 to 4, wherein the NH-azole is at least one compound selected from the group consisting of 1H-pyrrole which may have a substituent, indole which may have a substituent, carbazole which may have a substituent, benzocarbazoles which may have a substituent, dibenzocarbazoles which may have a substituent, indolocarbazoles which may have a substituent, biindoles which may have a substituent and bicarbazoles which may have a substituent.

6. The process according to any one of claims 1 to 5, wherein the basic magnesium compound is at least one kind selected from the group consisting of: inorganic basic magnesium compounds; and organic basic magnesium compounds represented by the following general formula (6):

$$R^{12}—Mg—R^{13} \quad (6)$$

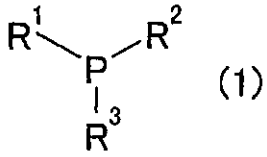
wherein Mg represents a magnesium atom; R^{12} and R^{13} each independently represents a hydrocarbyl group, an alkoxy group, an amino group or a halogeno group; and when R^{12} represents a halogeno group, R^{13} do not represent a halogeno group; and when R^{13} represents a halogeno group, R^{12} do not represent a halogeno group.

7. The process according to any one of claims 1 to 6, wherein the basic magnesium compound is a Grignard reagent.

CLAIMS

1. A process for producing an N-(hetero)arylazole, which comprises reacting a (hetero)aryl (pseudo)halide with an NH-azole in the presence of: a catalyst comprising a palladium compound and a coordination compound; and a basic magnesium compound, characterized in that coordination compound is at least one compound selected from the group consisting of:

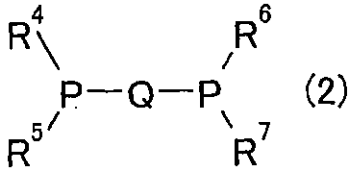
monophosphines represented by the following general formula (1)



(1)

wherein P represents a phosphorus atom, R^1 and R^2 each independently represents an alkyl group, and R^3 represents a hydrocarbyl group which may have a substituent, a heteroaryl group which may have a substituent or a ferrocenyl group which may have a substituent;

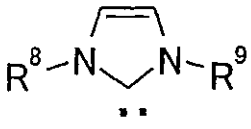
diphosphines represented by the following general formula (2)



(2)

wherein P represents a phosphorus atom, R^4 to R^7 each independently represents an alkyl group, or an aryl group which may have a substituent, and Q represents a divalent group which may have a substituent;

(benzo)imidazol-ylidenes represented by the following general formula (3-1) or (3-2)



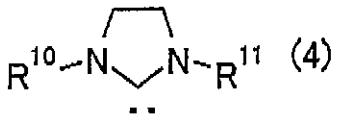
(3-1)



(3-2)

wherein N represents a nitrogen atom, R^8 and R^9 each independently represents an alkyl group; and

imidazolidin-ylidenes represented by the following general formula (4)



(4)

wherein N represents a nitrogen atom, and R^{10} and R^{11} each independently represents an alkyl group or an aryl group.

2. The process according to claim 1, wherein the (hetero)aryl (pseudo)halide is a compound represented by the following general formula (5)

$$(Het)Ar—X_n \quad (5)$$

wherein (Het)Ar represents an aromatic ring group which may have a substituent or a heteroaromatic ring group which may have a substituent, X represents a (pseudo)halogeno group, a subscript n of X represents the number of the substituent X into (Het)Ar, and is an integer of from 1 to 7.

3. The process according to claim 2, wherein X in the compound represented by the general formula (5) is a chloro group, a bromo group or a (halo)alkanesulfonyloxy group or an arenesulfonyloxy group, and n is an integer of from 1 to 3.

4. The process according to any one of claims 1 to 3, wherein the NH-azole is at least one compound selected from the group consisting of 1H-pyrrole which may have a substituent, indole which may have a substituent, carbazole which may have a substituent, benzocarbazoles which may have a substituent, dibenzocarbazoles which may have a substituent, indolocarbazoles which may have a substituent, biindoles which may have a substituent and bicarbazoles which may have a substituent.

5. The process according to any one of claims 1 to 4, wherein the basic magnesium compound is at least one kind selected from the group consisting of: inorganic basic magnesium compounds; and organic basic magnesium compounds represented by the following general formula (6):

$$R^{12}—Mg—R^{13} \quad (6)$$

wherein Mg represents a magnesium atom; R^{12} and R^{13} each independently represents a hydrocarbyl group, an alkoxy group, an amino group or a halogeno group; and when R^{12} represents a halogeno group, R^{13} do not represent a halogeno group; and when R^{13} represents a halogeno group, R^{12} do not represent a halogeno group.

6. The process according to any one of claims 1 to 5, wherein the basic magnesium compound is a Grignard reagent.