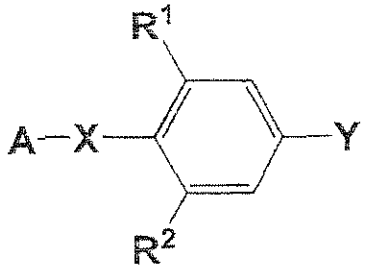
2-methylpropanoic acid, pivalic acid, or a salt thereof.

[34] The production process according to [32], wherein the carboxylic acid or a salt thereof is pivalic acid.

[0019a]

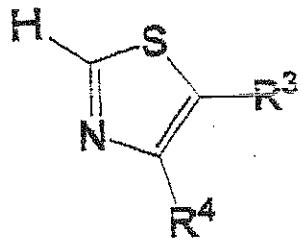
In one embodiment, the present invention relates to a process comprising reacting a compound represented by the following formula (1):



(1)

(In the formula (1), R^1 represents a hydrogen atom or halogen atom; R^2 represents a hydrogen atom, cyano group, nitro group, halogen atom, formyl group, or halomethyl group; A represents a hydrogen atom, C_1 to C_8 alkyl group, C_3 to C_6 cycloalkyl group, phenyl group, fluorine atom (only when X is a bond), or protecting group for a hydroxyl group (only when X is an oxygen atom), wherein A may be substituted by 1 to 3 substituents, such substituent representing a group selected from the group consisting of a halogen atom, C_1 to C_4 alkyl group, C_1 to C_4 alkoxy group, C_1 to C_4 alkylthio group, C_3 to C_6 cycloalkyl group, phenyl group, phenoxy group, and pyridyl group; X represents a bond (only when A is a phenyl group or fluorine atom) or oxygen atom; and Y represents a leaving group)

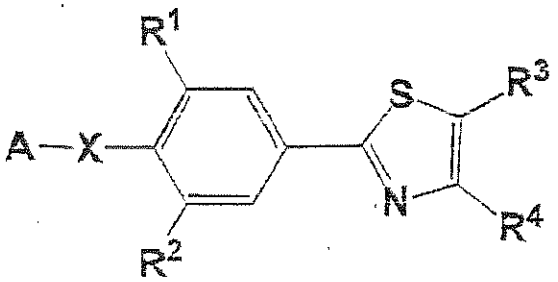
and a compound represented by the following formula (2):



(2)

(In the formula (2), H represents a hydrogen atom;

R^3 represents $COOR^{3a}$ or COR^{3b}; R^{3a} represents a hydrogen atom, C_1 to C_4 alkyl group, or ester-type protecting group for a carboxyl group; R^{3b} represents a amide-type protecting group for a carboxyl group, the protecting group forming an amide with a neighboring carbonyl group; R^4 represents a halogen atom, or C_1 to C_4 alkyl group in the presence of (i) a transition metal compound selected from the group consisting of zero-valent palladium and a salt of mon- and di-valent palladium, and (ii) a phosphine-type ligand capable of coordinating to the transition metal compound to produce a phenyl-substituted heterocyclic derivative represented by the following formula (3):



(3)

(in the formula (3), A, X, R^1, and R^2 are the same as defined in the formula (1); and R^3 and R^4 are the same as defined in the formula (2)).

[Advantageous Effects of Invention]

[0020]

According to the present invention, a phenyl-substituted heterocyclic derivative (a compound represented by the formula (3)) can be obtained in a process involving a small number of steps by subjecting a phenyl derivative (a compound represented by the formula (1)) and a heterocyclic derivative (a compound represented by the formula (2)) to a selective coupling reaction by using a transition metal catalyst.

[0021]

Furthermore, since the process involves a small number of steps, it is possible to produce the phenyl-substituted heterocyclic derivative (a compound represented by the formula (3)) in high yield and at low cost.

[Description of Embodiments]

[0022]

The terms used singly or in combination in the present description will be explained in the following. Unless otherwise noted, explanation of each substituent shall be common to each position. In addition, a combination of substituents and variables is allowed only when such a combination results in a chemically stable compound. When the substituent itself is substituted with two or more groups, these many groups can exist on the same or different carbon atom as long as a stable structure is formed.