COMMONWEALTH of AUSTRALIA 633183
Patents Act 1952

APPLICATION FOR A STANDARD PATENT

I/We

Sumitomo Chemical Company, Limited

of

5-33, Kitahama-4-chome, Chuo-ku, Osaka, Japan

hereby apply for the grant of a Standard Patent for an invention entitled:

A 1-pyridylimidazole derivative and its production and use

which is described in the accompanying complete specification.

Details of basic application(s):-

Number	Convention Country	Date
2-173135	Japan	29 June 1990
2-235439	Japan	4 September 1990

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

DATED this TWENTIETH day of FEBRUARY 1991

To: THE COMMISSIONER OF PATENTS

.....
a member of the firm of
DAVIES & COLLISON for
and on behalf of the
applicant(s)

Davies & Collison, Melbourne

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention.

In support of the Application made for a patent for an invention entitled: "A 1-PYRIDYLIMIDAZOLE DERIVATIVE AND ITS PRODUCTION AND USE"

Insert full name(s) and address(es) of declarant(s) being the applicant(s) or person(s) authorized to sign on behalf of an applicant company.

I, Yoshihiko NISHIZAWA, c/o SUMITOMO CHEMICAL COMPANY, LIMITED, of 5-33, Kitahama-4-chome, Chuo-ku, Osaka, Japan,

Cross out whichever of paragraphs 1(a) or 1(b) does not apply

1(a) relates to application made by individual(s)
1(b) relates to application made by company; insert name of applicant company.

do solemnly and sincerely declare as follows :-

1. (a) ~~I am the applicant for the patent~~

or (b) I am authorized by SUMITOMO CHEMICAL COMPANY, LIMITED, the applicant..... for the patent to make this declaration on its behalf.

Cross out whichever of paragraphs 2(a) or 2(b) does not apply

2(a) relates to application made by inventor(s)
2(b) relates to application made by company(s) or person(s) who are not inventor(s); insert full name(s) and address(es) of inventors.

2. (a) ~~I am the actual inventor of the invention~~

or (b)
1. Hiroki Tomioka
2. Noriyasu Sakamoto
3. Kimitoshi Umeda
4. Hiroaki Fujimoto
5. Takao Ishiwatari
6. Hirosi Kisida

Please see reverse side for addresses.

are the actual inventorS..... of the invention and the facts upon which the applicant..... is entitled to make the application are as follows :-

State manner in which applicant(s) derive title from inventor(s)

The applicant is the assignee of the invention from the inventors.

Cross out paragraphs 3 and 4 for non-convention applications. For convention applications, insert basic country(s) followed by date(s) and basic applicant(s).

3. The basic applicationS..... as defined by Section 141 of the Act was made

in Japan on the June 29, 1990
by SUMITOMO CHEMICAL COMPANY, LIMITED
in Japan on the September 4, 1990
by SUMITOMO CHEMICAL COMPANY, LIMITED
in ..... on the .....
by .....

4. The basic applicationS..... referred to in paragraph 3 of this Declaration were the first applicationS..... made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature.

Declared at Osaka, Japan this 31st day of January, 1991.

Signature of declarant(s) (no attestation required)

SUMITOMO CHEMICAL COMPANY, LIMITED

YOSHIHIKO NISHIZAWA
REPRESENTATIVE DIRECTOR

Note: Initial all alterations.

DAVIES & COLLISON, MELBOURNE and CANBERRA.

Hiroki TOMIOKA, of 10-3-322, Sonehigashinocho-2-chome,
Toyonaka-shi, Japan.

Nc riyasu SAKAMOTO, of 4-1-404, Ryodocho,
Nishinomiya-shi, Japan.

Kimitoshi UMEDA, of 11-8-307, Sonehigashinocho-2-chome,
Toyonaka-shi, Japan.

Hiroaki FUJIMOTO, of 11-7-407, Sonehigashinocho-2-chome,
Toyonaka-shi, Japan.

Takao ISHIWATARI, of 9-17, Sakuragaoka-4-chome,
Minoo-shi, Japan.

Hirosi KISIDA, of 1-12-402, Nigawatakamaru-2-chome,
Takarazuka-shi, Japan.

AU9171186

(12) PATENT ABRIDGMENT (11) Document No. AU-B-71186/91
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 633183

(54) Title
A 1-PYRIDYLIMIDAZOLE DERIVATIVE AND ITS PRODUCTION AND USE

International Patent Classification(s)
(51)[5] **C07D 401/04** **A01N 043/50**

(21) Application No. : **71186/91** (22) Application Date : **20.02.91**

(30) Priority Data

(31) Number	(32) Date	(33) Country
2-173135	29.06.90	JP JAPAN
2-235439	04.09.90	JP JAPAN

(43) Publication Date : **02.01.92**

(44) Publication Date of Accepted Application : **21.01.93**

(71) Applicant(s)
SUMITOMO CHEMICAL COMPANY, LIMITED

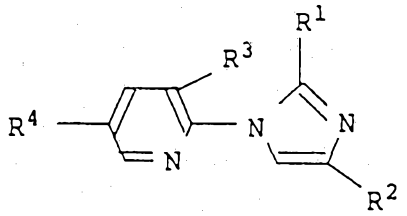
(72) Inventor(s)
HIROKI TOMIOKA; NORIYASU SAKAMOTO; KIMITOSHI UMEDA; HIROAKI FUJIMOTO; TAKAO ISHIWATARI; HIROSI KISIDA

(74) Attorney or Agent
DAVIES COLLISON CAVE , 1 Little Collins Street, MELBOURNE VIC 3000

(56) Prior Art Documents
AU 7118891 C07D 233/64
AU 71184/91 C07D 233/64
AU 54589/90 C07D 233/84

(57) Claim

1. A pyridylimidazole derivative having the formula:



wherein R^1 is a hydrogen atom, a C_1-C_3 alkyl group, a C_1-C_3 alkylthio group or a C_2-C_3 alkoxyalkyl group; R^2 is a hydrogen atom or a C_1-C_4 haloalkyl group; R^3 is a halogen atom, a nitro group or a trifluoromethyl group; R^4 is a C_1-C_3 haloalkyl group or a C_1-C_3 haloalkoxy group.

.../2

15. A method for controlling insect pests which comprises applying an insecticidally effective amount of the pyridylimidazole derivative according to claim 1 to the insect pests or to the locus where insect pests propagate.

633183

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

NAME & ADDRESS
OF APPLICANT:

Sumitomo Chemical Company, Limited
5-33, Kitahama-4-chome
Chuo-ku
Osaka
Japan

NAME(S) OF INVENTOR(S):

Hiroki TOMIOKA
Noriyasu SAKAMOTO
Kimitoshi UMEDA
Hiroaki FUJIMOTO
Takao ISHIWATARI
Hirosi KISIDA

ADDRESS FOR SERVICE:

DAVIES & COLLISON
Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

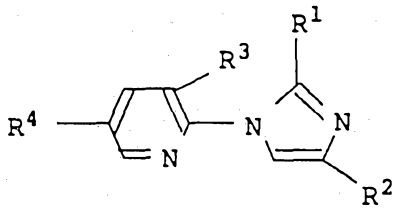
A 1-pyridylimidazole derivative and its production and use

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a novel pyridylimidazole derivative having the formula [I]:



[I]

wherein R^1 is a hydrogen atom, a C_1-C_3 alkyl group, a C_1-C_3 alkylthio group or a C_2-C_3 alkoxyalkyl group; R^2 is a hydrogen atom or a C_1-C_4 haloalkyl group; R^3 is a halogen atom, a nitro group or a trifluoromethy group; R^4 is a C_1-C_3 haloalkyl group or a C_1-C_3 haloalkoxy group, a process for producing the same and insecticides containing the same as an active ingredient.

2. Description of the Related Art

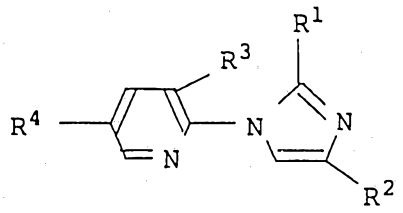
It is described in U.S. Patent 3,868,458, U.S. Patent 3,940,484 and U.S. Patent 3,996,366 that a certain imidazole derivative is useful as an active ingredient of insecticide.

As a result of extensive investigations on compounds having an excellent insecticidal effect, the present inventors have found a pyridylimidazole

derivative having the formula [I] exhibit an extremely high insecticidal effect, and thus have accomplished the present invention.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a pyridylimidazole derivative having the formula [I]:



[I]

wherein R^1 is a hydrogen atom, a C_1-C_3 alkyl group, a C_1-C_3 alkylthio group or a C_2-C_3 alkoxyalkyl group; R^2 is a hydrogen atom or a C_1-C_4 haloalkyl group; R^3 is a halogen atom, a nitro group or a trifluoromethy group ; R^4 is a C_1-C_3 haloalkyl group or a C_1-C_3 haloalkoxy group, a process for producing the same and insecticides containing the same as an active ingredient.

In the formula [I], examples of the halogen atom and the same as the substituent include a fluorine atom, a chlorine atom or a bromine atom.

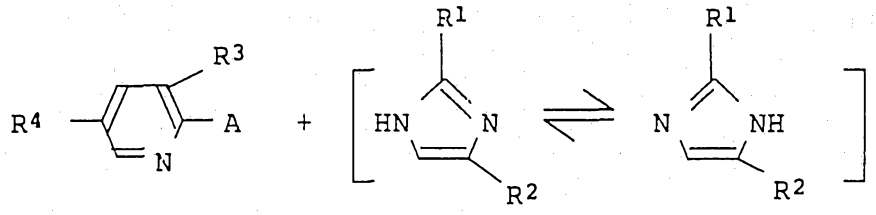
DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the present invention is explained in detail.

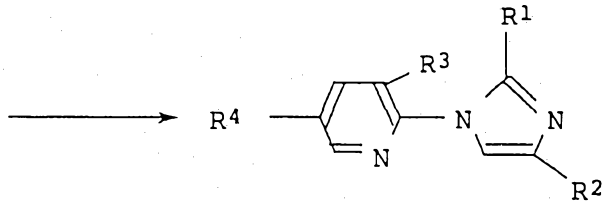
Among the pyridylimidazole derivative of the present invention, it wherein R^1 is a hydrogen atom or a C_1-C_3 alkyl group; R^2 is a C_1-C_3 haloalkyl group which comprises at least a fluorine atom, a chlorine atom or a bromine atom as the halogen atom; R^3 is a fluorine atom, a chlorine atom or a trifluoromethyl group; R^4 is a C_1-C_3 haloalkyl group which comprises at least a fluorine atom as the halogen atom, is preferred. More preferred is it wherein R^1 is a hydrogen atom or a methyl group; R^2 is a C_2 haloalkyl group which comprises at least a fluorine atom, a chlorine atom or a bromine atom as the halogen atom; R^3 is a fluorine atom or a chlorine atom; R^4 is a trifluoromethyl group.

Further, particularly more preferred is it wherein R^1 is a hydrogen atom or a methyl group; R^2 is a haloalkyl group represented by the formula, $-CF_2CF_2X$, in which X is a hydrogen atom, a fluorine atom, a chlorine atom or a bromine atom; R^3 is a chlorine atom; R^4 is a trifluoromethyl group; the most preferred being it wherein R^1 is a methyl group; R^2 is a haloalkyl group represented by the formula, $-CF_2CF_2X$, in which X is a hydrogen atom, a fluorine atom, a chlorine atom or a bromine atom; R^3 is a chlorine atom; R^4 is a trifluoromethyl group.

The compounds of the present invention can be produced according to the following reaction scheme.



[III] [II]



[I]

wherein R^1, R^2, R^3 and R^4 are each as defined above and A is a halogen atom.

The compound of the present invention can be produced by reacting halide compounds having the formula [III] with imidazole derivatives having the formula [II] at about -5°C to about 150°C for about 1 to 24 hours in a solvent in the presence of an reagent for removing a hydrogen halide.

The amounts of the reagents used in the reaction are 1--2 equivalents of the halide compounds having the formula [III] and 1-4 equivalents of the

reagent for removing a hydrogen halide to one equivalent of the imidazole derivatives having the formula [II].

Examples of the solvent which is used for the both reactions described above include aliphatic hydrocarbons such as hexane, heptane, ligroin, petroleum ether, etc.; aromatic hydrocarbons such as benzene, toluene, xylene, etc.; halogenated hydrocarbons such as chloroform, carbon tetrachloride, dichloroethane, chlorobenzene, dichlorobenzene, etc.; ethers such as diethyl ether, diisopropyl ether, dioxan, tetrahydrofuran, ethylene glycol dimethyl ether, etc.; ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone, isophorone, cyclohexanone, etc.; esters such as ethyl acetate, butyl acetate, etc.; nitro compounds such as nitroethane, nitrobenzene, etc.; nitriles such as acetonitrile, isobutyronitrile, etc.; tertiary amines such as pyridine, triethylamine, N,N-diethylaniline, tributylamine, N-methylmorpholine, etc.; acid amides such as formamide, N,N-dimethylformamide, N,N-dimethylacetamide, etc.; sulfur compounds such as dimethylsulfoxide, sulfolane, etc.; or mixtures thereof.

Examples of the reagent of removing hydrogen halide include organic bases such as pyridine, triethylamine, N,N-diethylaniline, etc.; inorganic bases such as sodium hydroxide, potassium hydroxide, sodium carbonate, potassium carbonate, sodium hydrogen carbonate, calcium carbonate, sodium hydride, etc.;

alkali metal alkoxides such as sodium methoxide, sodium ethoxide, etc.

After completion of the reaction, post-treatment follows in a conventional manner. If necessary and desired, the product may further be purified by chromatography, distillation, recrystallization, etc.

The imedazole derivatives having the formula [II] and the halide compounds having the formula [III] which are used as raw materials for the compounds of the present invention are prepared by the methods described in U.S. Patent 3,868,458, U.S. Patent 3,940,484, U.S. Patent 3,996,366, J. Org. Chem., 47, 2867 (1982), Japan Patent (laid open) 86-286,370 and U.S. Patent 3,888,932, U.S. Patent 3,928,416, European Patent 23,100, European Patent 34,402, West German Patent 2,606,393, West German Patent 3,545,570, U.S. Patent 4,184,041, British Patent 2,002,368, British Patent 1,121,211, Japan Patent (laid open) 84-20,269 respectively, or in a manner similar to the methods.

Examples of the compounds of the present invention are shown in Table 1 below.

R^1	R^2	R^3	R^4
H	CF_3	F	CF_3
H	CF_3	Cl	CF_3
H	CF_3	Br	CF_3
H	CF_3	NO_2	CF_3
H	CF_3	CF_3	CF_3
H	CF_2CF_2H	F	CF_3
H	CF_2CF_2H	Cl	CF_3
H	CF_2CF_2H	Br	CF_3
H	CF_2CF_2H	NO_2	CF_3
H	CF_2CF_2H	CF_3	CF_3
H	CF_2CF_3	F	CF_3
H	CF_2CF_3	Cl	CF_3
H	CF_2CF_3	Br	CF_3
H	CF_2CF_3	NO_2	CF_3
H	CF_2CF_3	CF_3	CF_3
H	CF_2CF_2Cl	F	CF_3
H	CF_2CF_2Cl	Cl	CF_3

- Cont'd -

(Cont'd)

H	CF_2CF_2Cl	Br	CF_3
H	CF_2CF_2Cl	NO_2	CF_3
H	CF_2CF_2Cl	CF_3	CF_3
H	CF_2CF_2Br	F	CF_3
H	CF_2CF_2Br	Cl	CF_3
H	CF_2CF_2Br	Br	CF_3
H	CF_2CF_2Br	NO_2	CF_3
H	CF_2CF_2Br	CF_3	CF_3
H	$CF_2CF_2CF_3$	F	CF_3
H	$CF_2CF_2CF_3$	Cl	CF_3
H	$CF_2CF_2CF_3$	Br	CF_3
H	$CF_2CF_2CF_3$	NO_2	CF_3
H	$CF_2CF_2CF_3$	CF_3	CF_3
H	$CF_2CF_2CF_2CF_3$	Cl	CF_3
H	$CF_2CF_2CF_2CF_3$	Br	CF_3
CH_3	CF_3	F	CF_3
CH_3	CF_3	Cl	CF_3

- Cont'd -

(Cont'd)

CH_3	CF_3	Br	CF_3
CH_3	CF_3	NO_2	CF_3
CH_3	CF_3	CF_3	CF_3
CH_3	CF_2CF_2H	F	CF_3
CH_3	CF_2CF_2H	Cl	CF_3
CH_3	CF_2CF_2H	Br	CF_3
CH_3	CF_2CF_2H	NO_2	CF_3
CH_3	CF_2CF_2H	CF_3	CF_3
CH_3	CF_2CF_3	F	CF_3
CH_3	CF_2CF_3	Cl	CF_3
CH_3	CF_2CF_3	Br	CF_3
CH_3	CF_2CF_3	NO_2	CF_3
CH_3	CF_2CF_3	CF_3	CF_3
CH_3	CF_2CF_2Cl	F	CF_3
CH_3	CF_2CF_2Cl	Cl	CF_3
CH_3	CF_2CF_2Cl	Br	CF_3
CH_3	CF_2CF_2Cl	NO_2	CF_3

- Cont'd -

(Cont'd)

CH_3	CF_2CF_2Cl	CF_3	CF_3
CH_3	CF_2CF_2Br	F	CF_3
CH_3	CF_2CF_2Br	Cl	CF_3
CH_3	CF_2CF_2Br	Br	CF_3
CH_3	CF_2CF_2Br	NO_2	CF_3
CH_3	CF_2CF_2Br	CF_3	CF_3
CH_3	$CF_2CF_2CF_3$	F	CF_3
CH_3	$CF_2CF_2CF_3$	Cl	CF_3
CH_3	$CF_2CF_2CF_3$	Br	CF_3
CH_3	$CF_2CF_2CF_3$	NO_2	CF_3
CH_3	$CF_2CF_2CF_3$	CF_3	CF_3
CH_3	$CF_2CF_2CF_2CF_3$	Cl	CF_3
CH_3	$CF_2CF_2CF_2CF_3$	Br	CF_3
C_2H_5	CF_3	F	CF_3
C_2H_5	CF_3	Cl	CF_3
C_2H_5	CF_3	Br	CF_3
C_2H_5	CF_3	CF_3	CF_3

- Cont'd -

(Cont'd)

C_2H_5	CF_2CF_2H	F	CF_3
C_2H_5	CF_2CF_2H	Cl	CF_3
C_2H_5	CF_2CF_2H	Br	CF_3
C_2H_5	CF_2CF_2H	CF_3	CF_3
C_2H_5	CF_2CF_3	F	CF_3
C_2H_5	CF_2CF_3	Cl	CF_3
C_2H_5	CF_2CF_3	Br	CF_3
C_2H_5	CF_2CF_3	CF_3	CF_3
C_2H_5	CF_2CF_2Cl	F	CF_3
C_2H_5	CF_2CF_2Cl	Cl	CF_3
C_2H_5	CF_2CF_2Cl	Br	CF_3
C_2H_5	CF_2CF_2Cl	CF_3	CF_3
C_2H_5	CF_2CF_2Br	F	CF_3
C_2H_5	CF_2CF_2Br	Cl	CF_3
C_2H_5	CF_2CF_2Br	Br	CF_3
C_2H_5	CF_2CF_2Br	CF_3	CF_3
C_2H_5	$CF_2CF_2CF_3$	F	CF_3

- Cont'd -

(Cont'd)

C_2H_5	$CF_2CF_2CF_3$	Cl	CF_3
C_2H_5	$CF_2CF_2CF_3$	Br	CF_3
C_2H_5	$CF_2CF_2CF_3$	CF_3	CF_3
C_3H_7-n	CF_3	F	CF_3
C_3H_7-n	CF_3	Cl	CF_3
C_3H_7-n	CF_3	Br	CF_3
C_3H_7-n	CF_3	CF_3	CF_3
C_3H_7-n	CF_2CF_2H	F	CF_3
C_3H_7-n	CF_2CF_2H	Cl	CF_3
C_3H_7-n	CF_2CF_2H	Br	CF_3
C_3H_7-n	CF_2CF_2H	CF_3	CF_3
C_3H_7-n	CF_2CF_3	F	CF_3
C_3H_7-n	CF_2CF_3	Cl	CF_3
C_3H_7-n	CF_2CF_3	Br	CF_3
C_3H_7-n	CF_2CF_3	CF_3	CF_3
C_3H_7-n	CF_2CF_2Cl	F	CF_3
C_3H_7-n	CF_2CF_2Cl	Cl	CF_3

- Cont'd -

(Cont'd)

C_3H_7-n	CF_2CF_2Cl	Br	CF_3
C_3H_7-n	CF_2CF_2Cl	CF_3	CF_3
C_3H_7-n	CF_2CF_2Br	F	CF_3
C_3H_7-n	CF_2CF_2Br	Cl	CF_3
C_3H_7-n	CF_2CF_2Br	Br	CF_3
C_3H_7-n	CF_2CF_2Br	CF_3	CF_3
C_3H_7-n	$CF_2CF_2CF_3$	F	CF_3
C_3H_7-n	$CF_2CF_2CF_3$	Cl	CF_3
C_3H_7-n	$CF_2CF_2CF_3$	Br	CF_3
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C_3H_7-iso	CF_3	Cl	CF_3
C_3H_7-iso	CF_3	Br	CF_3
C_3H_7-iso	CF_3	CF_3	CF_3
C_3H_7-iso	CF_2CF_2H	F	CF_3
C_3H_7-iso	CF_2CF_2H	Cl	CF_3
C_3H_7-iso	CF_2CF_2H	Br	CF_3

- Cont'd -

(Cont'd)

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C_3H_7-iso	CF_2CF_3	F	CF_3
C_3H_7-iso	CF_2CF_3	Cl	CF_3
C_3H_7-iso	CF_2CF_3	Br	CF_3
C_3H_7-iso	CF_2CF_3	CF_3	CF_3
C_3H_7-iso	CF_2CF_2Cl	F	CF_3
C_3H_7-iso	CF_2CF_2Cl	Cl	CF_3
C_3H_7-iso	CF_2CF_2Cl	Br	CF_3
C_3H_7-iso	CF_2CF_2Cl	CF_3	CF_3
C_3H_7-iso	CF_2CF_2Br	F	CF_3
C_3H_7-iso	CF_2CF_2Br	Cl	CF_3
C_3H_7-iso	CF_2CF_2Br	Br	CF_3
C_3H_7-iso	CF_2CF_2Br	CF_3	CF_3
C_3H_7-iso	$CF_2CF_2CF_3$	F	CF_3
C_3H_7-iso	$CF_2CF_2CF_3$	Cl	CF_3
C_3H_7-iso	$CF_2CF_2CF_3$	Br	CF_3
C_3H_7-iso	$CF_2CF_2CF_3$	CF_3	CF_3

- Cont'd -

(Cont'd)

H	CF_3	Cl	$OCHF_2$
H	CF_2CF_2H	Cl	$OCHF_2$
H	CF_2CF_3	Cl	$OCHF_2$
H	CF_2CF_2Cl	Cl	$OCHF_2$
H	CF_2CF_2Br	Cl	$OCHF_2$
H	$CF_2CF_2CF_3$	Cl	$OCHF_2$
CH_3	CF_3	Cl	$OCHF_2$
CH_3	CF_2CF_2H	Cl	$OCHF_2$
CH_3	CF_2CF_3	Cl	$OCHF_2$
CH_3	CF_2CF_2Cl	Cl	$OCHF_2$
CH_3	CF_2CF_2Br	Cl	$OCHF_2$
CH_3	$CF_2CF_2CF_3$	Cl	$OCHF_2$
H	CF_3	Br	$OCHF_2$
H	CF_2CF_2H	Br	$OCHF_2$
H	CF_2CF_3	Br	$OCHF_2$
H	CF_2CF_2Cl	Br	$OCHF_2$
H	CF_2CF_2Br	Br	$OCHF_2$
H	$CF_2CF_2CF_3$	Br	$OCHF_2$

- Cont'd -

(Cont'd)

CH_3	CF_3	Br	$OCHF_2$
CH_3	CF_2CF_2H	Br	$OCHF_2$
CH_3	CF_2CF_3	Br	$OCHF_2$
CH_3	CF_2CF_2Cl	Br	$OCHF_2$
CH_3	CF_2CF_2Br	Br	$OCHF_2$
CH_3	$CF_2CF_2CF_3$	Br	$OCHF_2$
H	CF_3	Cl	$OCClF_2$
H	CF_2CF_2H	Cl	$OCClF_2$
H	CF_2CF_3	Cl	$OCClF_2$
H	CF_2CF_2Cl	Cl	$OCClF_2$
H	CF_2CF_2Br	Cl	$OCClF_2$
H	$CF_2CF_2CF_3$	Cl	$OCClF_2$
CH_3	CF_3	Cl	$OCClF_2$
CH_3	CF_2CF_2H	Cl	$OCClF_2$
CH_3	CF_2CF_3	Cl	$OCClF_2$
CH_3	CF_2CF_2Cl	Cl	$OCClF_2$
CH_3	CF_2CF_2Br	Cl	$OCClF_2$
CH_3	$CF_2CF_2CF_3$	Cl	$OCClF_2$

Examples of harmful insects against which the compounds of the present invention exhibit remarkable effects include the following:

Harmful insects belonging to Hemiptera:

Planthoppers such as small brown planthopper (Laodelphax striatellus), brown planthopper (Nilaparvata lugens), white-backed rice planthopper (sogatella furcifera), etc.; leafhoppers such as green rice leafhopper (Nephotettix cinticeps), (Nephotettix virescens), etc.; aphids, bugs, whiteflies, scales, lace bugs, psyllids, etc.

Lepidoptera:

Pyralid moths such as rice stem borer (Chilo suppressalis), rice leafroller (Cnaphalocrocis medinalis), Indian meal moth (Plodia interpunctella), etc.; moths such as tobacco cutworm (Spodoptera litura), rice armyworm (Pseudaletia separata), cabbage armyworm (Mamestra brassicae), etc.; Pieridae such as common cabbageworm (Pieris rapae crucivora), etc.; Tortricidae or tortricid moths such as Adoxophyes spp., Grapholita spp., etc.; Carposinidae, lyonetiid moths (Lyonetiidae), tussock moths (Lymantriidae), beet semi-looper (Autographa nigrisigna); harmful insects belonging to Agrothis spp. such as turnip cutworm (Agrothis segetum), black cutworm (Agrothis ipsilon); harmful insects belonging to Hiliothis spp.; diamondback moth (Plutella xylostella), clothes moths (Tineidae), casemaking

clothes moth (Tinea translucens), webbing clothes moth (Tineola bisselliella); etc.

Harmful insects belonging to Diptera:

Mosquitos such as common mosquito (Culex pipiens pallens), Culex tritaeniorhynchus, etc.; Aedes spp.such as Aedes aegypti, Aedes albopictus, etc.; Anopheles spp. such as Anopheles sinensis, etc.; midges (Chironomidae); Muscidae such as housefly (Musca domestica), false stablefly (Muscina stabulans), etc.; Calliphoridae; Sarcophagidae; lesser housefly (Fannia canicularis); Anthomyiidae or anthomyiid flies such as seedcorn maggot (Delia platura), onion maggot (Delia antiqua), etc.; fruit flies (Tephritidae); small fruit flies (Drosophilidae); moth flies (Psychodidae); black flies (Simuliidae); Tabanidae; stable flies (Stomoxyidae); etc.

Harmful insects belonging to Coleoptera:

Corn root worms such as western corn rootworm (Diabrotica virgifera), southern corn root worm (Diabrotica undecimpunctata), etc.; scarabs (Scarabaeidae) such as cupreous chafer (Anomala cuprea), soybeen beetle (Anomala rufocuprea), etc.; weevils such as maize weevil (Sitophilus zeamais), rice water weevil (Lissorhoptrus oryzophilus), adzuki been weevil (Callosobruchys chineneis), etc.; darkling beetles (Tenebrionidae) such as yellow mealworm (Tenebrio molitor), red fluor beetle (Tribolium castaneum), etc.; leaf beetles (Chrysomelidae) such as cucurbit leaf

beetle (Aulacophora femoralis), striped flea beetles (Phyllotreta striolata), etc.; Anobiidae; Epilachna spp. such as twenty-eight-spotted ladybirds (Epilachna vigintioctopunctata), etc.; powderpost beetles (Lyctidae); false powderpost beetles (Bostrychidae), Cerambycidae; robe beetle (Paederus fusipes), etc.

Harmful insects belonging to Dictyoptera:

German cockroach (Blattella germanica), smokybrown cockroach (Periplaneta fuliginosa), American cockroach (Periplaneta americana), brown cockroach (Periplaneta brunnea), oriental cockroach (Blatta orientalis), etc.

Harmful insects belonging to Thysanoptera:

Thrips palmi, flower thrips (Thrips hawaiiensis), etc.

Harmful insects belonging to Hymenoptera:

ants (Formicidae); hornets (Vespidae); bethylid wasps (Bethylidae); sawflies (Tenthredinidae) such as cabbage sawfly (Athalia rosae ruficornis), etc.

Harmful insects belonging to Orthoptera:

mole crickets (Gryllotalpidae); grasshoppers (Acrididae), etc.;

Harmful insects belonging to Aphaniptera:

Purex irritans, etc.

Harmful insects belonging to Anoplura:

Pediculus humanus capitis, Phthirus pubis, etc.

Harmful insects belonging to Isoptera:

Reticulitermes speratus, Formosan subterranean termite (Coptotermes formosanus), etc.

Moreover, the compounds of the present invention are very effective to the insects which develop the resistance against conventional insecticides.

In the case that the compounds of the present invention are used as the active ingredient of insecticidal compositions, the compounds may be used as they are, without adding any other components but in general, the compounds are mixed with a solid carrier, a liquid carrier, a gaseous carrier, a feed, etc. and, if necessary and desired, the mixture is further supplemented with a surfactant and other adjuvants used to prepare insecticidal preparations and prepared into forms such as oil sprays, emulsifiable concentrates, wettable powders, flowable concentrated, granules, dusts, aerosol, fumigants (fogging, etc.), poison bait, etc.

These formulations contain generally 0.01 to 95% by weight of the compounds of the present invention as the active ingredient.

Examples of the solid carrier used for making formulations include fine powders or granulates, etc. of clays (kaolin clay, diatomaceous earth, synthetic hydrated silicon dioxide, bentonite, Fubasami clay terra alba, etc.), talc, ceramics, other inorganic minerals

(sericite, quartz, sulfur, activated carbon, calcium carbonate, hydrated silica, etc.), chemical fertilizers (ammonium sulfate, ammonium phosphate, ammonium nitrate, urea, ammonium chloride, etc.), etc. Examples of the liquid carrier include water, alcohols (methanol, ethanol, etc.), ketones (acetone, methyl ethyl ketone, etc.), aromatic hydrocarbons (benzene, toluene, xylene, ethylbenzene, methylnaphthalene, etc.), aliphatic hydrocarbons (hexane, cyclohexane, kerosene, gas oil, etc.), esters (ethyl acetate, butyl acetate, etc.), nitriles (acetonitrile, isobutyronitrile, etc.), ethers (diisopropyl ether, dioxan, etc.), acid amides (N,N-dimethylformamide, N,N-dimethylacetamide, etc.), halogenated hydrocarbons (dichloromethane, trichloroethane, carbon tetrachloride, etc.), dimethylsulfoxide; vegetable oils such as soybean oil, cotton seed oil, etc. Examples of the gaseous carrier, i.e., propellant, include freon gas, butane gas, LPG (liquefied petroleum gas), dimethyl ether, carbon dioxide, etc.

Examples of the surfactant include alkyl sulfates, alkyl sulfonic acid salts, alkylaryl sulfonic acid salts, alkyl aryl ethers and polyoxyethylene derivatives thereof, polyethylene glycol ether, polyvalent alcohol esters, sugar alcohol derivatives, etc.

Examples of the adjuvants such as binders, dispersing agents, etc. for formulations include casein, gelatin, polysaccharides (starch powders, gum arabic,

cellulose derivatives, alginic acid, etc.), lignin derivatives, bentonite, sugars, synthetic water-soluble high molecular substances (polyvinyl alcohol, polyvinyl-pyrrolidone, polyacrylic acid, etc.). Examples of the stabilizer include PAP (acidic isopropyl phosphate), BHT (2,6-di-tert-butyl-4-methylphenol), BHA (mixture of 2-tert-butyl-4-methoxyphenol and 3-tert-butyl-4-methoxyphenol), vegetable oils, mineral oils, surfactants, fatty acids or esters thereof, and the like.

As a base material for the poison baits, there are, for example, feed components such as crop powders, essential vegetable oil, sugars, crystalline cellulose etc.; antioxidants such as dibutylhydroxytoluene, nordihydroguaiaretic acid, etc.; preservatives such as dehydroacetic acid, etc.; feeding error preventing agents such as red peper powders, etc.; incentive flavor such as cheese flavor, onion flavor, etc.

The thus obtained formulations may be used as they are or after diluting with water, etc. Alternatively, the formulations may be used as admixture with other insecticides, nematocides, acaricides, bacteriocides, herbicides, plant growth regulators, synergistic agents, fertilizers, soil conditioners, animal feed, etc., or may also be used simultaneously with them, without mixing therewith.

Where the compounds of the present invention are used as insecticides for agricultural use, the dose

is generally 0.1 g to 100 g per 10 ares; when emulsifiable concentrates, wettable powders, flowable concentrates, etc. are used after diluting them with water, the concentration is 0.1 ppm to 500 ppm. Granules, dusts, etc. may be used as they are, without diluting them. For purposes of household and public hygiene, emulsifiable concentrates, wettable powders, flowable concentrates, etc. are diluted with water in a concentration of 0.1 ppm to 500 ppm; oils, aerosol, fumigants, poison baits, etc. may be used as they are.

These doses and concentrations may vary depending upon kind of formulations, timing for application, place applied, method for application, kinds of insect, condition of damages, etc. and may be increased or decreased, irrespective of the ranges set forth above.

Hereafter the present invention is described in more detail, by referring to synthesis examples, formulation examples and test examples but is not deemed to these examples.

Synthesis Example 1 (Synthesis of Compound No. (3))

To a solution of 0.37 g (2 m mol) of 4(5)-pentafluoroethylimidazole in 5 ml of N,N-dimethyl formamide was added 80 mg (2 m mol) of an oily sodium hydride (60%) while cooling with ice, followed by stirring at the same temperature for 10 minutes. After the reaction was completed, to the reaction mixture was

added dropwise 0.43 g (2 m mol) of 2,3-dichloro-5-trifluoromethylpyridine, followed by stirring at room temperature for 8 hours. After the reaction was completed, the reaction mixture was poured into water, and extracted with ethyl acetate. Further, then the residue was washed with brine, dried over magnesium sulfate, and concentrated under reduced pressure. The obtained product was subjected to silica gel chromatography to give 0.24 g of 1-(3-chloro-5-trifluoromethyl-pyridin-2-yl)-4-pentafluoroethylimidazole.

m.p. 52.0°C

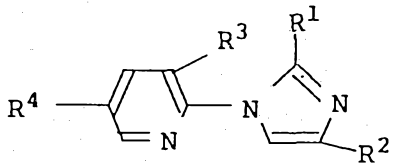
Synthesis Example 2 (Synthesis of Compound No. (11))

To a solution of 0.22 g (1 m mol) of 2-methyl-4(5)-(2-chloro-1,1,2,2-tetrafluoroethyl) imidazole in 5 ml of N,N-dimethylformamide was added both of 0.21 g (1.5 m mol) of anhydrous potassium carbonate and 0.22 g (1 m mol) of 2,3-dichloro-5-trifluoromethylpyridine, followed by stirring at 80-85°C for 7 hours. After the reaction was completed, the reaction mixture was poured into water, and extracted with ethyl acetate. Further, then the residue was washed with brine, dried over magnesium sulfate, and concentrated under reduced pressure. The obtained product was subjected to silica gel chromatography to give 0.27 g of 1-(3-chloro-5-trifluoromethyl pyridin-2-yl)-2-methyl-4-(2-chloro-1,1,2,2-tetrafluoroethyl imidazole.

m.p. 137.5°C

Examples of the present invention prepared in the same manner as above are shown in Table 2.

Table 2



Compound No.	R^1	R^2	R^3	R^4	Physical constant
(1)	H	CF_3	Cl	CF_3	m.p. 73.3°C
(2)	H	CF_2CF_2H	Cl	CF_3	$n_D^{25.4}$ 1.4813
(3)	H	CF_2CF_3	Cl	CF_3	m.p. 52.0°C
(4)	H	CF_2CF_3	CF_3	CF_3	$n_D^{23.9}$ 1.4220
(5)	H	CF_2CF_2Br	Cl	CF_3	$n_D^{24.0}$ 1.4999
(6)	H	CF_2CF_2Br	CF_3	CF_3	$n_D^{24.5}$ 1.4550
(7)	CH_3	$CF_2CF_2CF_3$	Cl	CF_3	m.p. 77.9°C
(8)	CH_3	CF_3	Cl	CF_3	m.p. 73.5°C
(9)	CH_3	CF_2CF_2H	Cl	CF_3	m.p. 147.9°C
(10)	CH_3	CF_2CF_3	Cl	CF_3	m.p. 85.3°C
(11)	CH_3	CF_2CF_2Cl	Cl	CF_3	m.p. 137.5°C
(12)	CH_3	CF_2CF_2Br	Cl	CF_3	m.p. 63-65°C
(13)	CH_3	CF_2CF_2Br	CF_3	CF_3	m.p. 60.3°C

Next, Formulation examples are shown, wherein parts are all by weight and the compounds of the present invention are designated by the compound numbers shown in Table 2.

Formulation Example 1. Emulsifiable concentrate

After 10 parts each of Compounds (1) through (13) of the present invention are dissolved in 35 parts of xylene and 35 parts of dimethylformamide, 14 parts of polyoxyethylene styrylphenyl ether and 6 parts of calcium dodecylbenzenesulfonate are added to the solutions. The resulting mixtures are thoroughly mixed stirred to give 10% emulsifiable concentrate, respectively.

Formulation Example 2. Wettable powder

After 20 parts of Compound (1) through (13) of the present invention are added to a mixture of 4 parts of sodium laurylsulfate, 2 parts of calcium lignin-sulfonate, 20 parts of synthetic hydrated silicon dioxide fine powders and 54 parts of diatomaceous earth, the mixture is mixed and stirred with a juice mixer to give 20% wettable powder.

Formulation Example 3. Granule

After 5 parts of synthetic hydrated silicon dioxide fine powders, 5 parts of sodium dodecylbenzene-sulfonate, 30 parts of bentonite and 55 parts of clay

are added to 5 parts of Compound (1) through (13) of the present invention, the mixture is thoroughly mixed and stirred. A suitable amount of water is further added to the mixture followed by stirring. The mixture is granulated with a granulator and air-dried to give 5% granule.

Formulation Example 4. Dust

After 1 part of Compound (7) of the present invention is dissolved in a appropriate amount of acetone, 5 parts of synthetic hydrated silicon dioxide fine powders, 0.3 part of PAP and 93.7 parts of clay are added to the solution. The mixture is mixed and stirred with a juice mixer and acetone is evaporated off to give 1% dust.

Formulation Example 5. Flowable concentrate

After 20 parts of Compound (12) of the present invention and 1.5 part of sorbitan trioleate are mixed with 28.5 parts of an aqueous solution containing 2 parts of polyvinyl alcohol, the mixture is finely divided (less than 3 μ in particle diameter) with a sand grinder. Then, 40 parts of aqueous solution containing 0.05 part of xanthane gum and 0.1 part of aluminum magnesium silicate are added to the powders and 10 parts of propylene glycol are further added thereto. The mixture is thoroughly mixed and stirred to give 20% flowable concentrate for aqueous suspension.

Formulation Example 6. Oil spray

After 0.1 part of Compound (1) through (13) of the present invention is dissolved in 5 parts of xylene and 5 parts of trichloroethane, the solution is mixed with 89.9 parts of deodorized kerosene to give 0.1% oil spray.

Formulation Example 7. Oil-based aerosol

After 0.1 part of Compound (1) through (13) of the present invention, 0.2 part of tetramethrin, 0.1 part of d-phenothrin, 10 parts of trichloroethane and 59.6 parts of deodorized kerosene are mixed with each other and dissolved. The solution is filled in an aerosol container. After a valve is mounted to the container, 30 parts of propellant (liquefied petroleum gas) are filled under pressure through the valve to give oil-based aerosol.

Formulation Example 8. Water-based aerosol

After 0.2 part of Compound (11) of the present invention, 0.2 part of d-allethrin, 0.2 part of d-phenothrin, 5 parts of xylene, 3.4 parts of deodorized kerosene and 1 part of emulsifier [ATMOS 300 (registered trademark, Atlas Chemical Co., Ltd.)] are mixed with each other and dissolved. The solution and 50 parts of distilled water are filled in an aerosol container. After a valve is mounted to the container, 40 parts of propellant (liquefied petroleum gas) are filled under

pressure through the valve to give water-based aerosol.

Formulation Example 9. Mosquito coil

After 0.3 g of d-allethrin is added to 0.3 g of Compound (12) of the present invention, the mixture is dissolved in 20 ml of acetone. The solution is then uniformly mixed with 99.4 g of carrier for mosquito-coil (taba powder : sake lees powder : wood powder of 4 : 3 : 3) with stirring and 120 ml of water is then added to the mixture. The mixture is thoroughly kneaded, molded and dried to give mosquito-coil.

Formulation Example 10. Electric mosquito mat

Acetone is added to 0.4 g of Compound (12) of the present invention, 0.4 g of d-allethrin and 0.4 g of piperonyl butoxide to dissolve and make the whole volume 10 ml. This solution, 0.5 ml, is uniformly impregnated with a base material for electric mat (a mixture of cotton linter and pulp solidified in a plate-like form) having 2.5 cm × 1.5 cm and a thickness of 0.3 cm to give an electric mosquito mat.

Formulation Example 11. Fumigant

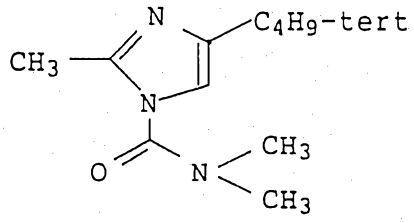
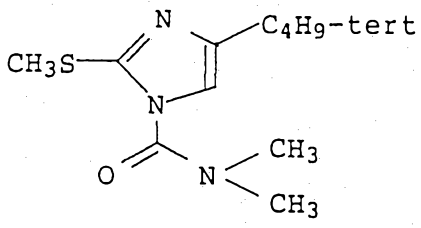
After 100 mg of Compound (12) of the present invention is dissolved in a appropriate amount of acetone, the solution is impregnated with a porous ceramic plate having 4.0 cm × 4.0 cm and a thickness of 1.2 cm to give a fumigant.

Formulation Example 12. Poison bait

After 10 mg of Compound (1) through (13) of the present invention is dissolved in a 0.5 ml acetone, the solution is applied to 5 g of the powder of dry animal food. The powder is dried to give a 0.5% poison bait.

Next, effectiveness of the compounds of the present invention as the active ingredient of insecticidal compositions is described below, with reference to test examples, wherein the compounds of the present invention are designated by the compound numbers shown in Table 2 and compounds used for comparison and control are designated by the compound numbers shown in Table 3.

Table 3

Compound Symbol	Chemical Structure	Note
(A)		Compound described in U.S. Patent 3,868,458 and 3,940,484
(B)		Compound described in U.S. Patent 3,996,366

Test Example 1 (Insecticidal test on nymphs of brown planthopper)

The emulsifiable concentrate of the test compound prepared according to Formulation Example 1 was diluted with water (corresponding to 500, 5, 0.5 ppm) and a rice plant seedling (length of about 12 cm) was immersed in the dilution for a minute. After air-drying, the rice plant seedling was put in a test tube and about 30 nymphs of brown planthopper (Nilaparvata lugens) were released. Six days after, the nymphs were observed if they were alive or dead. Criterion for the judgment is as follows.

a: no insect was alive.

b: alive insects were 5 or less.

c: alive insects were 6 or more.

The results are shown in Table 4.

Table 4

Test Compound	Concentration (ppm)	Efficacy
(1)	500	a
(2)	500	a
	5	a
(3)	500	a
	5	a
(4)	500	a
(5)	500	a
	5	a
(6)	500	a
(7)	500	a
(8)	500	a
(9)	500	a
	5	a
	0.5	a
(10)	500	a
	5	a
	0.5	a
(11)	500	a
	5	a
	0.5	a
(12)	500	a
	5	a
	0.5	a
(13)	500	a
Untreated	–	c

Test Example 2 (Insecticidal test on southern corn rootworm)

On the bottom of a polyethylene cup having a diameter of 5.5 cm, a filter paper which is of the same size was laid down and 1 ml of an aqueous dilution (500 or 50 ppm) of the emulsifiable concentrate of the test compound prepared according to Formulation Example 1 was dropped onto the filter paper and one corn sprout was put as feed. About 30 eggs of southern corn rootworm (Diabrotica undecimpunctata) were put in the cup. Eight days after the cup was covered, dead or alive larvae hatched were examined. Criterion for the judgment is as follows.

a: no insect was alive.

b: alive insects were 5 or less.

c: alive insects were 6 or more.

The results are shown in Table 5.

Table 5

Test Compound	Concentration (ppm)	Efficacy
(1)	500	a
	50	a
(2)	500	a
	50	a
(3)	500	a
	50	a
(4)	500	a
	50	a
(5)	500	a
	50	a
(6)	500	a
	50	a
(7)	500	a
	50	a
(8)	500	a
	50	a
(9)	500	a
	50	a
(10)	500	a
	50	a
(11)	500	a
	50	a
(12)	500	a
	50	a
(13)	500	a
	50	a
Untreated		c

Test Example 3 (Insecticidal test on common mosquito)

The emulsifiable concentrate of the test compound prepared according to Formulation Example 1 was diluted with water and 0.7 ml of the dilution was added to 100 ml of ion exchange water (concentration of the effective ingredient was 3.5 ppm). In the mixture were released 20 last instar larvae of common mosquito (Culex pipiens pallens). One day after the release, mortality was examined.

Criterion for the judgment is as follows.

a: 90% or more

b: not less than 10% but less than 90%

c: less than 10%

The results are shown in Table 6.

Table 6

Test Compound	Efficacy
(1)	a
(2)	a
(3)	
(4)	
(5)	
(6)	a
(7)	a
(8)	a
(9)	a
(10)	a
(11)	a
(12)	a
(13)	a
Untreated	c

Test Example 4 (Insecticidal test on German cockroach)

On the bottom of a polyethylene cup having a diameter of 5.5 cm, a filter paper which is of the same size was laid down and 0.7 ml of an aqueous dilution (500 ppm) of the emulsifiable concentrate of the test compound prepared according to Formulation Example 1 was dropped onto the filter paper. As feed, 30 mg of sucrose was uniformly spread thereon. In the cup, 10 adult males of German cockroach (Blattella germanica)

were released. Six days after the cup was covered, dead or alive insects were examined to determine mortality. The results are shown in Table 7.

Table 7

Test Compound	Mortality (%) 500 ppm
(1)	100
(2)	100
(3)	100
(4)	100
(5)	100
(6)	100
(7)	100
(8)	100
(9)	100
(10)	100
(11)	100
(12)	100
(13)	100
(A)	0
(B)	0
Untreated	0

Test Example 5 (Insecticidal test on housefly)

On the bottom of a polyethylene cup having a diameter of 5.5 cm, a filter paper which is of the same size was laid down and 0.7 ml of an aqueous dilution (500 ppm) of the emulsifiable concentrate of the test

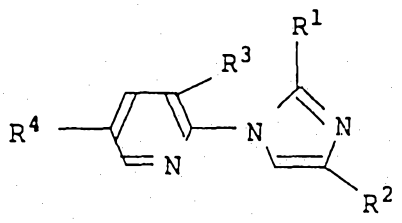
compound prepared according to Formulation Example 1 was dropped onto the filter paper. As feed, 30 mg of sucrose was uniformly spread thereon. In the cup, 10 adult females of housefly (Musca domestica) were released. Forty eight hours after the cup was covered, dead or alive insects were examined to determine mortality (2 replications). The results are shown in Table 8.

Table 8

Test Compound	Mortality (%) 500 ppm
(1)	100
(2)	100
(3)	100
(4)	100
(5)	100
(6)	100
(7)	100
(8)	100
(9)	100
(10)	100
(11)	100
(12)	100
(13)	100
Untreated	0

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A pyridylimidazole derivative having the formula:



wherein R^1 is a hydrogen atom, a C_1-C_3 alkyl group, a C_1-C_3 alkylthio group or a C_2-C_3 alkoxyalkyl group; R^2 is a hydrogen atom or a C_1-C_4 haloalkyl group; R^3 is a halogen atom, a nitro group or a trifluoromethyl group; R^4 is a C_1-C_3 haloalkyl group or a C_1-C_3 haloalkoxy group.

2. A pyridylimidazole derivative according to claim 1, wherein R^1 is a hydrogen atom or a C_1-C_3 alkyl group; R^2 is a C_1-C_3 haloalkyl group which comprises at least a fluorine atom, a chlorine atom or a bromine atom as the halogen atom; R^3 is a fluorine atom, a chlorine atom or a trifluoromethyl group; R^4 is a C_1-C_3 haloalkyl group which comprises at least a fluorine atom as the halogen atom.

3. A pyridylimidazole derivative according to claim 1, wherein R^1 is a hydrogen atom or a methyl group; R^2 is a C_2 haloalkyl group which comprises at least a fluorine atom, a chlorine atom or a bromine atom

as the halogen atom; R^3 is a fluorine atom or a chlorine atom; R^4 is a trifluoromethyl group.

4. A pyridylimidazole derivative according to claim 1, wherein R^1 is a hydrogen atom or a methyl group; R^2 is a haloalkyl group represented by the formula, $-CF_2CF_2X$, in which X is a hydrogen atom, a fluorine atom, a chlorine atom or a bromine atom; R^3 is a chlorine atom; R^4 is a trifluoromethyl group.

5. A pyridylimidazole derivative according to claim 1, wherein R^1 is a methyl group; R^2 is a haloalkyl group represented by the formula, $-CF_2CF_2X$, in which X is a hydrogen atom, a fluorine atom, a chlorine atom or a bromine atom; R^3 is a chlorine atom; R^4 is a trifluoromethyl group.

6. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-4-(1,1,2,2-tetrafluoroethyl)imidazole.

7. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-4-pentafluoroethylimidazole.

8. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-4-(2-bromo-1,1,2,2-tetrafluoroethyl)imidazole.

9. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-2-methyl-4-(1,1,2,2-tetrafluoroethyl)imidazole.

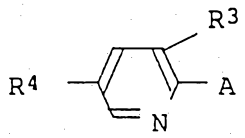
10. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-

2-yl)-2-methyl-4-pentafluoroethylimidazole.

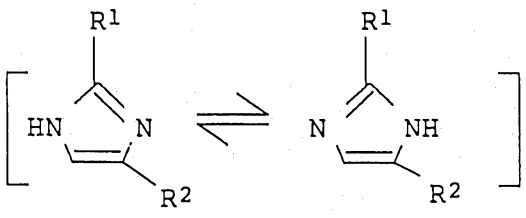
11. A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-2-methyl-(2-chloro-1,1,2,2-tetrafluoroethyl) imidazole.

12 A pyridylimidazole derivative according to claim 1, which is 1-(3-chloro-5-trifluoromethylpyridin-2-yl)-2-methyl-(2-bromo-1,1,2,2-tetrafluoroetyl) imidazole.

13. A process for producing a pyridylimidazole derivative according to claim 1, which comprises reacting a halide compound having the formula;



wherein R^3 is a halogen atom, a nitro group or a trifluoromethyl group; R^4 is a C_1–C_3 haloalkyl grcup or a C_1–C_3 haloalkoxy group; A is a halogen atom, with an imidazole derivative having the formula;



wherein R^1 is a hydrogen atom, a C_1–C_3 alkyl group, a C_1–C_3 alkylthio group or a C_2–C_3 alkoxyalkyl group; R^2 is a hydrogen atom or a C_1–C_4 haloalkyl group.

14. An insecticidal composition which comprises an insecticidally effective amount of the pyridylimidazole derivative according to claim 1 and an inert carrier.

15. A method for controlling insect pests which comprises applying an insecticidally effective amount of the pyridylimidazole derivative according to claim 1 to the insect pests or to the locus where insect pests propagate.

~~16. Use of the pyridylimidazole derivative according to claim 1 as a insecticide.~~

16. Compounds of formula (I), processes for their production or insecticidal compositions or methods involving them, substantially as hereinbefore described with reference to the Examples.

DATED this 28th day of October,1992
Sumitomo Chemical Company, Limited
By Its Patent Attorneys
DAVIES COLLISON CAVE