AUSTRALIA
Patents Act 1990

NOTICE OF ENTITLEMENT

I,

TAIHO PHARMACEUTICAL COMPANY, LIMITED

of

1-27, KANDANISHIKI-CHO
CHIYODA-KU
TOKYO-TO
JAPAN

being the applicant in respect of this Application state the following:-

The person(s) nominated for the grant of the patent:

The nominated person is the assignee of the inventors.

The person(s) nominated for the grant of the patent:

The applicant and nominated person is the basic applicant.

The basic application(s) listed in the declaration made under Article 8 of the PCT is/are the first application(s) made in a Convention country in respect of the invention.

TAIHO PHARMACEUTICAL COMPANY, LIMITED

09th September 1991

GRIFFITH HACK & CO.

Patent Attorneys for and
on behalf of the applicant.

M 030021 090991

(12) PATENT ABRIDGMENT (11) Document No. AU-B-70577/91
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 623306

(54) Title
PROCESS FOR PRODUCING ISOXAZOLE DERIVATIVE

International Patent Classification(s)
(51)[5] **C07D 261/08**

(21) Application No. : **70577/91** (22) Application Date : **22.01.91**

(87) PCT Publication Number : **WO91/11443**

(30) Priority Data

(31) Number	(32) Date	(33) Country
2-14239	**24.01.90**	**JP JAPAN**

(43) Publication Date : **21.08.91**

(44) Publication Date of Accepted Application : **07.05.92**

(71) Applicant(s)
TAIHO PHARMACEUTICAL COMPANY, LIMITED

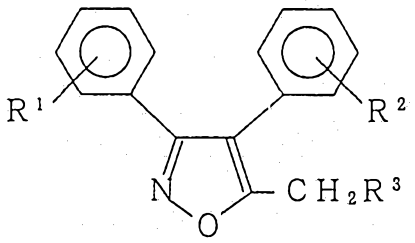
(72) Inventor(s)
MOTOAKI TANAKA; YUICHI HAGIWARA; MAKOTO KAJITANI; MITSUGI YASUMOTO

(74) Attorney or Agent
GRIFFITH HACK & CO , GPO Box 1285K, MELBOURNE VIC 3001

(56) Prior Art Documents
JP 60-75471

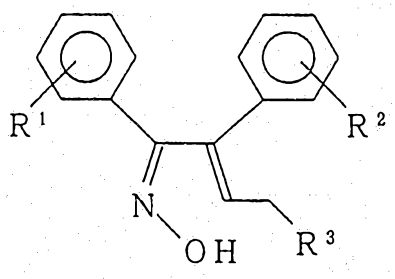
(57) Claim

1. A process for producing isoxazole derivatives represented by the formula



(II)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and R^3 is cyano or alkoxycarbonyl, the process being characterized by oxidizing an α ,β -unsaturated ketoxime derivative represented by the formula



(I)

wherein R^1, R^2 and R^3 are as defined above.

PCT OPI DATE 21/08/91 APPLN. ID 70577 / 91
AOJP DATE 03/10/91 PCT NUMBER PCT/JP91/00064

(51) 国際特許分類5 C07D 261/08	A1	(11) 国際公開番号 WO 91/11443
		(43) 国際公開日 1991年8月8日(08. 08. 1991)

(21) 国際出願番号 PCT/JP91/00064
(22) 国際出願日 1991年1月22日(22. 01. 91)

(30) 優先権データ
特願平2/14239 1990年1月24日(24. 01. 90) JP

(71) 出願人(米国を除くすべての指定国について)
大鵬薬品工業株式会社
(TAIHO PHARMACEUTICAL COMPANY, LIMITED)
〔JP/JP〕
〒101 東京都千代田区神田錦町1－27 Tokyo, (JP)
(72) 発明者；および
(75) 発明者／出願人(米国についてのみ)
田中基明(TANAKA, Motoaki)〔JP/JP〕
〒359 埼玉県所沢市狭山ヶ丘1－34－29 Saitama, (JP)
萩原裕一(HAGIWARA, Yuichi)〔JP/JP〕
〒358 埼玉県入間市高倉2－3－1 ワコーレ入間409号
Saitama, (JP)
梶谷 亮(KAJITANI, Makoto)〔JP/JP〕
〒350-12 埼玉県入間郡日高町武蔵台1－25－8 Saitama, (JP)
安本三治(YASUMOTO, Mitsugi)〔JP/JP〕
〒367 埼玉県本庄市前原2－8－19 Saitama, (JP)
(74) 代理人
弁理士 田村 巌(TAMURA, Iwao)
〒530 大阪府大阪市北区曽根崎1丁目2番8号 マルビル
田村特許事務所 Osaka, (JP)

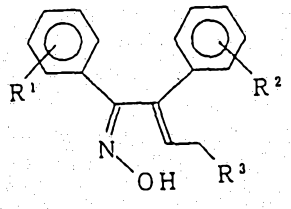
(81) 指定国
AT(欧州特許), AU, BE(欧州特許), CA, CH(欧州特許), DE(欧州特許), DK(欧州特許), ES(欧州特許), FR(欧州特許), GB(欧州特許), GR(欧州特許), IT(欧州特許), KR, LU(欧州特許), NL(欧州特許), SE(欧州特許), US.

添付公開書類 国際調査報告書

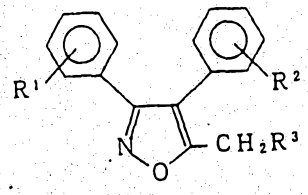
623306

(54) Title : PROCESS FOR PRODUCING ISOXAZOLE DERIVATIVE

(54) 発明の名称 イソキサゾール誘導体の製造方法



(I)



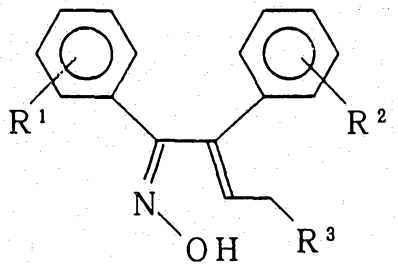
(II)

(57) Abstract

A process for producing an isoxazole derivative of general formula (II), wherein R^1 and R^2 may be the same or different from each other and each represents hydrogen or lower alkoxy, and R^3 represents cyano or alkoxycarbonyl, by oxidizing an α,β-unsaturated ketoxime derivative of general formula (I), wherein R^1, R^2 and R^3 are as defined above. The isoxazole derivative (II) is useful as an intermediate for the production of (3,4-diaryl-isoxazol-5-yl)acetic acid derivatives useful as an antiinflammatory, analgesic and antipyretic.

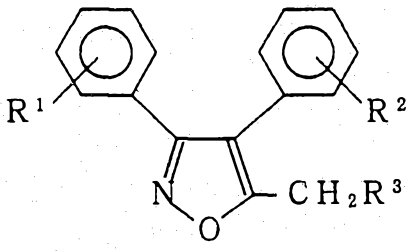
(57) 要約

本発明は一般式



（Ⅰ）

（式中、R^1及びR^2は同一又は相異なつて、水素原子、低級アルコキシ基、R^3はシアノ基又はアルコキシカルボニル基を示す。）で表わされるα，β－不飽和ケトオキシム誘導体を酸化することを特徴とする一般式



（Ⅱ）

（式中、R^1、R^2及びR^3は前記に同じ）で表わされるイソキサゾール誘導体の製造方法に係る。

本発明の方法により製造されるイソキサゾール誘導体（Ⅱ）は抗炎症剤、鎮痛剤及び解熱剤として有用な（3,4－ジアリールイソキサゾール－5－イル）酢酸誘導体の製造中間体として有用である。

情報としての用途のみ
PCTに基づいて公開される国際出願のパンフレット第1頁にPCT加盟国を同定するために使用されるコード

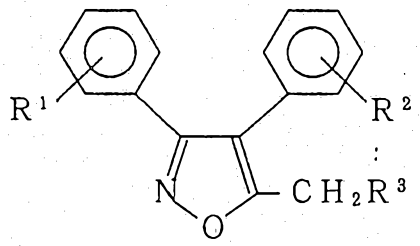
AT オーストリア
AU オーストラリア
BB バルバードス
BE ベルギー
BF ブルキナ・ファソ
BG ブルガリア
BJ ベナン
BR ブラジル
CA カナダ
CF 中央アフリカ共和国
CG コンゴー
CH スイス
CI コート・ジボアール
CM カメルーン
CS チェコスロバキア
DE ドイツ
DK デンマーク
ES スペイン
FI フィンランド
FR フランス
GA ガボン
GI ギニア
GB イギリス
GR ギリシャ
HU ハンガリー
IT イタリー
JP 日本
KP 朝鮮民主主義人民共和国
KR 大韓民国
LI リヒテンシュタイン
LK スリランカ
LU ルクセンブルグ
MC モナコ
MG マダガスカル
ML マリ
MN モンゴル
MR モーリタニア
MW マラウイ
NL オランダ
NO ノルウェー
PL ポーランド
RO ルーマニア
SD スーダン
SE スウェーデン
SN セネガル
SU ソビエト連邦
TD チャード
TG トーゴ
US 米国

SPECIFICATION

PROCESS FOR PRODUCING ISOXAZOLE DERIVATIVES

Technical field :

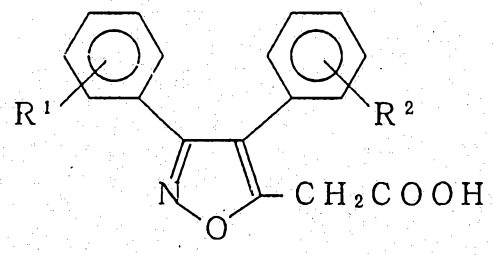
The present invention relates to a process for industrially advantageously producing isoxazole derivatives represented by the formula



(II)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and R^3 is cyano or alkoxycarbonyl.

The isoxazole derivatives to be produced by the process of the present invention are useful as intermediates for preparing (3,4-diarylisoxazol-5-yl)acetic acid derivatives which are represented by the formula



(A)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and which are useful as anti-inflammatory agents, analgesics and antipyretics.

AUSTRALIAN PATENT OFFICE

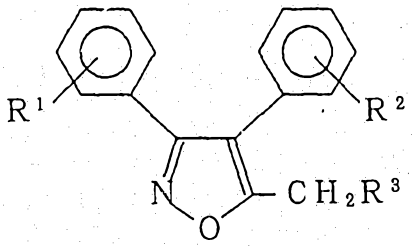
Background art :

Among the isoxazole derivatives represented by the formula (II), the compounds wherein R^3 is cyano are prepared by the known process which is disclosed in JP-A-75471/1985. This process comprises reacting 3,4-diaryl-5-methylisoxazole with a halogenating agent and then with a cyanogenation agent. The compounds of the formula wherein R^3 is alkoxycarbonyl are novel compounds.

An object of the present invention is to provide a novel and preferred process, which is entirely different from the conventional process, for producing isoxazole derivatives represented by the formula (II) and useful as intermediates for preparing the compounds (A).

Disclosure of the invention :

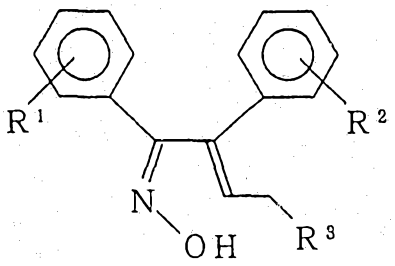
The present invention provides a process for producing isoxazole derivatives represented by the formula



(II)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and R^3 is cyano or alkoxycarbonyl, the process being characterized by oxidizing an α,β-unsaturated ketoxime derivative represented by the formula

AUSTRALIAN PATENT OFFICE

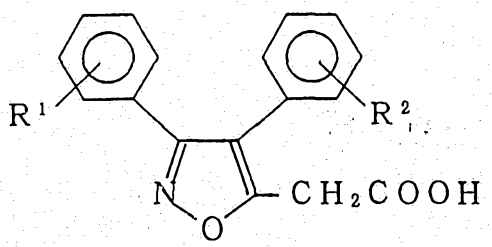


(I)

wherein R^1, R^2 and R^3 are as defined above.

According to the present invention, preferred examples of lower alkoxyl groups represented by R^1 and R^2 are straight-chain or branched-chain alkoxyl groups having 1 to 6 carbon atoms, such as methoxy, ethoxy, n-propoxy, isopropoxy, n-butoxy, isobutoxy, sec-butoxy, tert-butoxy, pentyloxy and hexyloxy. Examples of alkoxycarbonyl groups represented by R^3 are straight-chain or branched-chain alkoxycarbonyl groups having 2 to 7 carbon atoms, such as methoxycarbonyl, ethoxycarbonyl, n-propoxycarbonyl, isopropoxycarbonyl, n-butoxycarbonyl, isobutoxycarbonyl, sec-butoxycarbonyl, tert-butoxycarbonyl, pentyloxycarbonyl and hexyloxycarbonyl.

The isoxazole derivatives to be produced by the process of the invention are useful as intermediates for preparing (3,4-diarylisoxazol-5-yl)acetic acid derivatives which are useful as anti-inflammatory agents, analgesics and antipyretics and which are represented by the formula

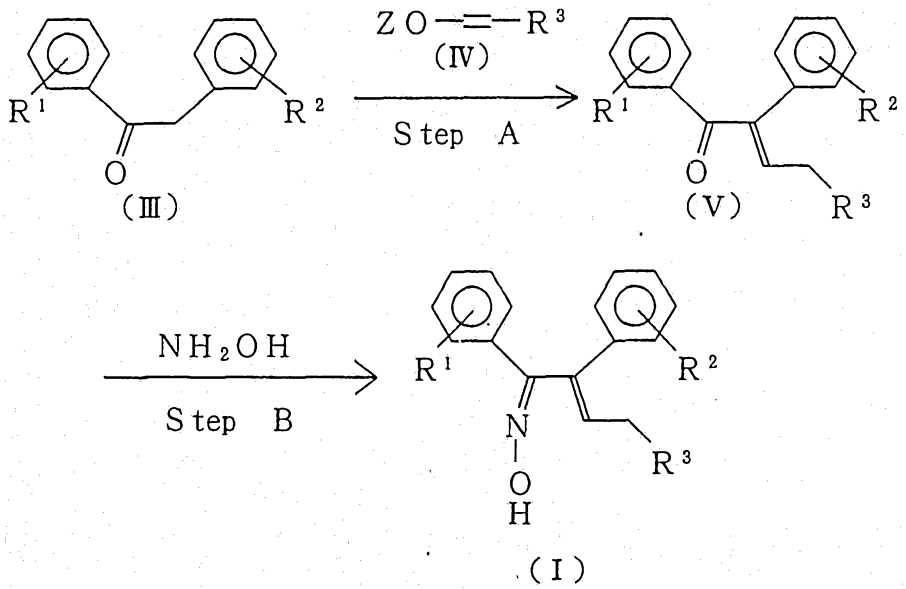


(A)

AUSTRALIAN PATENT OFFICE

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl.

The compound (I) for use in the present invention is prepared, for example, in accordance with the following reaction scheme.



wherein R^1, R^2 and R^3 are as defined above, and Z is lower alkyl.

Examples of lower alkyl groups represented by Z in the above scheme are straight-chain or branched-chain alkyl groups having 1 to 6 carbon atoms, such as methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, tert-butyl, pentyl and hexyl.

More specifically, the steps represented by the above reaction scheme are performed in the following manner.

Step A

A deoxybenzoin derivative represented by the formula

AUSTRALIAN PATENT OFFICE

(Ⅲ) is reacted with an alkoxyacrylonitrile or alkoxyacrylic acid derivative represented by the formula (Ⅳ) in a suitable solvent in the presence of a base to obtain a compound of the formula (Ⅴ). The solvent is not limited specifically insofar as it does not participate in the reaction. Examples of useful solvents are various organic solvents including methanol, ethanol, tert-butanol and like alcohols, tetrahydrofuran, dioxane and like ethers, benzene, toluene, xylene and like aromatic hydrocarbons, carbon tetrachloride, chloroform, dichloromethane and like hydrocarbon halides, acetonitrile, pyridine, dimethylformamide, etc. These solvents can be used singly or in admixture. Examples of useful bases are sodium hydroxide, sodium methoxide, potassium tert-butoxide, butyl lithium and like alkali bases, triethylamine, dimethylaminopyridine and like organic bases, etc. For the reaction, it is desirable to use 1 to 3 moles of the compound of the formula (Ⅳ) per mole of the compound of the formula (Ⅲ), and 0.1 to 3 moles of the base per mole of the compound of the formula (Ⅲ). The reaction is conducted at a temperature of up to 200 ℃, preferably from 0 ℃ approximately to the boiling point of the solvent. The reaction usually takes about 0.5 to about 20 hours for completion.

Step B

The compound represented by the formula (Ⅴ) and obtained by step A is reacted with hydroxylamine or a salt thereof in a suitable solvent to thereby obtain a compound represented by the formula (Ⅰ). The salt of hydroxylamine to

AUSTRALIAN PATENT OFFICE

be used for the reaction is not limited specifically and is, for example, the hydrochloric acid salt, sulfuric acid salt or the like. The solvent is not limited specifically insofar as it does not participate in the reaction. Examples of useful solvents are various organic solvents including methanol, ethanol, tert-butanol and like alcohols, tetrahydrofuran, dioxane and like ethers, benzene, toluene, xylene and like aromatic hydrocarbons, carbon tetrachloride, chloroform, dichloromethane and like hydrocarbon halides, acetonitrile, pyridine, dimethylformamide, etc. These solvents can be used singly or in admixture. For the reaction, it is desirable to use 1 to 10 moles of hydroxylamine or a salt thereof per mole of the compound of the formula (V). The reaction is conducted at a temperature of 0 to 200 ℃, preferably from 40 ℃ approximately to the boiling point of the solvent. The completion of the reaction usually takes about 1 to about 30 hours.

The process of the invention for producing an isoxazole derivative represented by the formula (II) is characterized by oxidizing the compound of the formula (I) obtained according to the above reaction scheme. More specifically, the present invention resides in reacting the compound of the formula (I) with an oxidizing agent in a suitable solvent or in the absence of any solvent.

The oxidation process to be employed in the present invention is, for example, a process disclosed in "Lectures on New Experimental Chemistry," Vol.15, I -1, I -2, "Oxidation and Reduction," edited by the Chemical Society of Japan,

AUSTRALIAN PATENT OFFICE

published by Maruzen Co., Ltd. Examples of useful processes are a process using an oxidizing reagent such as potassium permanganate, manganese dioxide, potassium periodate, sodium periodate, ruthenium tetroxide or like oxide, lead tetracetate, mercury acetate, iron (Ⅲ) chloride, potassium hexacyanoferrate (Ⅲ) or like metal salt, hydrogen peroxide solution, peracetic acid or like peroxide, or the like, an autoxidation process using air or oxygen, an organic electrolytic oxidation process utilizing anodic oxidation, etc.

For the reaction wherein the oxidizing reagent is used, it is desirable to use 0.2 to 10 moles of the reagent per mole of the compound of the formula (I). The solvent is not limited specifically insofar as it does not participate in the reaction. Examples of useful solvents are various organic solvents such as dichloromethane, chloroform, carbon tetrachloride and like hydrocarbon halides, benzene, toluene and like aromatic hydrocarbons, methanol, ethanol and like alcohols, diethyl ether, tetrahydrofuran and like ethers, acetone, hexane, acetic acid, etc. These solvents can be used singly, in admixture or as admixed with water. The reaction temperature is -20 to 100 ℃, preferably 5 to 70 ℃. The completion of the reaction usually takes about 5 minutes to about 10 hours. When required, the reaction may be conducted with addition of an acid or base, or in a solvent mixture including a buffer or the like.

The autoxidation process and the organic electrolytic oxidation process are conducted by passing air,

AUSTRALIAN PATENT OFFICE

oxygen or current through the reaction system in a suitable solvent. The solvent is not limited specifically insofar as it does not participate in the reaction. Examples of useful solvents are various organic solvents such as dichloromethane, chloroform, carbon tetrachloride and like hydrocarbon halides, benzene, toluene and like aromatic hydrocarbons, methanol, ethanol and like alcohols, diethyl ether, tetrahydrofuran and like ethers, acetone, hexane, acetic acid and the like. These solvents can be used singly, in admixture, or as mixed with water. The reaction temperature is -20 to 100 ℃ , preferably 5 to 70 ℃ . The completion of the reaction usually takes about 5 minutes to about 24 hours. It is known that the reaction proceeds generally efficiently in the presence of a catalyst. Preferably, the catalyst is used in an amount of 1×10^{-5} to 10 moles per mole of the compound of the formula (I). Although the catalyst is not limited specifically, examples of useful catalysts are metals such as cobalt, rhodium, palladium, copper, cerium and ruthenium, or salts, oxides, complexes or like compounds of such metals. When required, the reaction may be conducted with addition of an acid or base, or in a solvent mixture including a buffer or the like.

The compound of the invention thus obtained can be isolated and purified by usual known methods, for example, by distillation, recrystallization or silica gel column chromatography.

The isoxazole compound represented by the formula (II) and prepared by the above process is subjected, as isolated or as it is without isolation, to solvolysis or to

AUSTRALIAN PATENT OFFICE

hydrolysis in the presence of an acid or base, whereby a (3,4-diarylisoxazol-5-yl)acetic acid derivative represented by the formula (A) and having anti-inflammatory and analgesic activities can be derived from the compound of the invention. The solvolysis or hydrolysis can be conducted by solvolysis process disclosed in JP-A-75471/1985 or by the hydrolysis process generally employed in the art concerned. Generally used as the acid is an inorganic acid such as hydrochloric acid, sulfuric acid or nitric acid, or as the base is an inorganic base such as sodium hydroxide, potassium hydroxide or sodium carbonate.

Best mode of carrying out the invention :

The present invention will be described below in detail with reference to reference examples and examples.

Reference Example 1

Preparation of methyl 4,5-bis(4-methoxyphenyl)-5-oxo-3-pentenoate

To 430 mℓ of tert-butanol were added 128 g of deoxyanisoin, 67.3 g of potassium tert-butoxide and 116 g of methyl 3-methoxyacrylate, and the mixture was stirred at 70 ℃ for 3 hours. After the completion of reaction, the reaction mixture was allowed to stand at room temperature with addition of n-hexane. The product separating out was filtered off and dissolved with 1000 mℓ of ethyl acetate and 300 mℓ of 3N sulfuric acid. The organic layer was collected, washed with 3N sulfuric acid and a saturated aqueous solution of sodium chloride, and dried over anhydrous magnesium sulfate. The organic layer was concentrated at a reduced pressure, giving

AUSTRALIAN PATENT OFFICE

153 g (yield 90 %) of the above-identified compound as an oily product.

An NMR spectrum revealed that the compound was a mixture of isomers (about 6:4) due to a double bond. The mixture was recrystallized from hexane-ethyl acetate as required, whereby one of the isomers was isolated in the form of white crystals.

Melting point 101~ 103 ℃

IR absorption spectrum (KBr)

ν max(cm^{-1}) 1732, 1640, 1600

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.31(2H, d), 3.72(3H, s), 3.80(3H, s), 3.85(3H, s), 6.37(1H, t), 6.90(4H, d), 7.23(2H, d), 7.89(2H, d)

The mother liquor further gave the other isomer of the compound in the form of an oily product.

IR absorption spectrum (KBr)

ν max(cm^{-1}) 1732, 1662, 1596

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.15(2H, d), 3.65(3H, s), 3.77(3H, s), 3.83(3H, s), 6.30(1H, t), 6.6~ 7.1(4H, m), 7.30(2H, d), 7.92(2H, d)

Reference Example 2

Preparation of 4,5-bis(4-methoxyphenyl)-5-oxo-3-pentenenitrile

The identified compound was obtained as an oily product by conducting the same reaction as in Reference Example 1 with the exception of using 3-methoxyacrylonitrile instead of methyl 3-methoxyacrylate.

IR absorption spectrum ($NaC\ell$)

AUSTRALIAN PATENT OFFICE

ν max(cm^{-1}) 2250, 1660, 1606

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.17(2H, d), 3.78(3H, s), 3.85(3H, s), 6.03(3H, t),

6.7~ 7.0(4H, m), 7.27(2H, d), 7.90(2H, d)

Reference Example 3

Preparation of methyl 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenoate

The isomer mixture of 4,5-bis(4-methoxyphenyl)-5-oxo-3-pentenoate (24.5 g) obtained in Reference Example 1 and 51.5 g of hydroxylamine hydrochloride was heated under reflux in a mixture of 650 mℓ of methanol and 72 mℓ of water for 23 hours. With the progress of reaction at this time, 0.9 equivalent weight of sodium hydrogencarbonate was added in divided portions to the reaction system. On completion of the reaction, the methanol was distilled off at a reduced pressure. The residue was dissolved with water and ethyl acetate, and the organic layer was collected, washed with a saturated aqueous solution of sodium chloride and dried over anhydrous magnesium sulfate. The organic layer was concentrated at a reduced pressure, and the residue was subjected to silica gel column chromatography (eluants: ethyl acetate-n-hexane) for separation and purification, affording 23 g (yield 90 %) of the above-identified compound as an oily product.

IR absorption spectrum ($NaC\ell$)

ν max(cm^{-1}) 1732, 1608

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.1~ 3.2(2H, m), 3.65(3H, s), 3.76(3H, s), 3.77(3H, s),

AUSTRALIAN PATENT OFFICE

6.48(1H, t), 6.81(4H, d), 7.35(2H, d), 7.58(4H, d), 8.72(1H, bs)

Reference Example 4

Preparation of 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenenitrile

The identified compound was prepared as an oily product by conducting the same reaction as in Reference Example 3 with the exception of using 4,5-bis(4-methoxyphenyl)-5-oxo-3-pentenenitrile in place of 4,5-bis(4-methoxyphenyl)-5-oxo-3-pentenoate.

IR spectrum (NaCℓ)

ν max(cm^{-1}) 2252, 1596

NMR spectrum ($CDCℓ_3$) δ (ppm)

3.12, 3.15(2H, dd), 3.77(3H, s), 3.78(3H, s), 6.18(1H, t), 6.84(4H, d), 7.32(4H, d), 7.55(2H, d), 8.46(1H, bs)

Example 1

Preparation of 5-methoxycarbonylmethyl-3,4-bis(4-methoxyphenyl)isoxazole (II a)

A 3.7 g quantity of methyl 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenoate was heated at 60 ℃ with stirring for 24 hours in 40 mℓ of acetic acid in the presence of 0.4 g of cobalt acetate tetrahydrate while passing air through the mixture. After addition of 3N sulfuric acid, the reaction mixture was subjected to extraction with ethyl acetate, and the organic layer was washed with a saturated solution of potassium carbonate and then with a saturated aqueous solution of sodium chloride and dried over anhydrous magnesium sulfate. The organic layer was concentrated at a reduced pressure, and

AUSTRALIAN PATENT OFFICE

the residue was subjected to silica gel column chromatography (eluants: ethyl acetate-n-hexane) for separation and purification, giving 3.3 g (yield 90 %) of the above-identified compound as a while solid product.

Melting point 67~ 68 ℃

IR absorption spectrum (KBr)

ν max(cm^{-1}) 1730

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.73(3H, s), 3.77(2H, s), 3.79(3H, s), 3.82(3H, s), 6.83(2H, d), 6.90(2H, d), 7.15(2H, d), 7.40(2H, d)

Mass spectrum

M^+ (m/z) 353

Example 2

Preparation of 5-cyanomethyl-3,4-bis(4-methoxyphenyl)isoxazole (II b)

The identified compound was obtained as a white solid product (yield 80 %) in the same manner as in Example 1 with the exception of using 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenenitrile in place of methyl 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenoate.

Melting point 103~ 104 ℃

IR absorption spectrum (KBr)

ν max(cm^{-1}) 2264

NMR spectrum ($CDC\ell_3$) δ (ppm)

3.80(3H, s), 3.83(2H, s), 3.85(3H, s), 6.8~ 7.5(8H, m)

Mass spectrum

M^+ (m/z) 320

A 1.77 g quantity of the 5-methoxycarbonylmethyl-

AUSTRALIAN PATENT OFFICE

3,4-bis(4-methoxyphenyl)isoxazole (II a) obtained in Example 1 was added to 15 mℓ of 2 % aqueous solution of sodium hydroxide, followed by stirring at 40 ℃ overnight. After the completion of reaction, the reaction mixture was washed with ether twice. While cooling the mixture with ice, 5 mℓ of 10 % hydrochloric acid was subsequently added thereto, followed by extraction with ethyl acetate, then washing with a saturated aqueous solution of sodium chloride and thereafter drying over anhydrous magnesium sulfate. The organic layer was concentrated at a reduced pressure, giving 3,4-bis(4-methoxyphenyl)-isoxazol-5-acetic acid as a white solid product (melting at 147~ 148 ℃).

Example 3

Preparation of 5-methoxycarbonylmethyl-3,4-bis(4-methoxyphenyl)isoxazole (II a)

A 1.75 g (5 mmols) quantity of methyl 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenoate was dissolved in 8.5 mℓ of dichloromethane and 4 mℓ of acetic acid, then 0.79 g of potassium permanganate was slowly added to the solution at room temperature, and the mixture was stirred for 4 hours. After the completion of reaction, a hydrogen peroxide solution was added to the reaction mixture until the mixture became transparent. The mixture was diluted with 10 mℓ of dichloromethane, subsequently washed with water, with sodium hydrogencarbonate and with a saturated aqueous solution of sodium chloride successively, and dried over anhydrous magnesium sulfate. The dried product was subjected to silica gel column chromatography (eluants: ethyl acetate-n-

AUSTRALIAN PATENT OFFICE

hexane) for separation and purification, affording 10.2 g (yield 60 %) of the above-identified compound as a white solid product.

The melting point, IR absorption spectrum and NMR spectrum of the product coincided with those of the compound obtained in Example 1.

Example 4

Preparation of 5-methoxycarbonylmethyl-3,4-bis(4-methoxyphenyl)isoxazole (II a)

A 1.2 g (3.38 mmols) quantity of methyl 5-hydroxyimino-4,5-bis(4-methoxyphenyl)-3-pentenoate was dissolved in 19 mℓ of acetic acid, and the solution was added dropwise to a suspension composed of 0.44 g (5.1 mmols) of manganese dioxide and 5 mℓ of acetic acid at 60 ℃. After the completion of addition, the mixture was stirred at 60 ℃ for one hour. After the completion of reaction, hydrogen peroxide was added to the reaction mixture to decompose excess manganese dioxide. The same procedure as in Example 3 was thereafter repeated to obtain 0.78 g (yield 65 %) of the above-identified product.

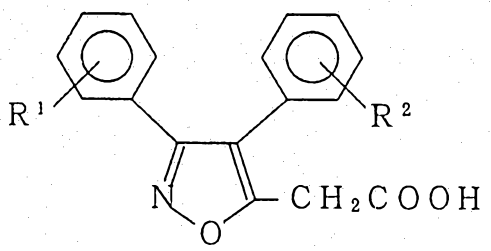
The melting point, IR absorption spectrum and NMR spectrum of the product coincided with those of the compound obtained in Example 1.

Industrial applicability :

The isoxazole derivative produced by the process of the invention is useful as an intermediate for preparing a (3,4-diarylisoxazol-5-yl)acetic acid derivative which is useful as an anti-inflammatory agent, analgesic and

AUSTRALIAN PATENT OFFICE

antipyretic and which is represented by the formula



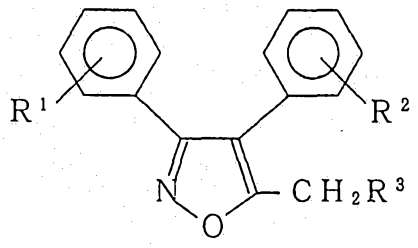
(A)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl.

AUSTRALIAN PATENT OFFICE

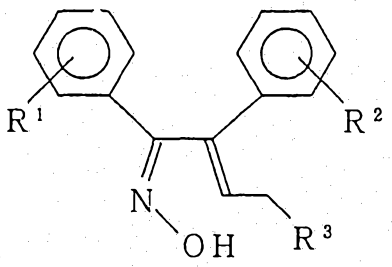
CLAIM

1. A process for producing isoxazole derivatives represented by the formula



(II)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and R^3 is cyano or alkoxycarbonyl, the process being characterized by oxidizing an α ,β -unsaturated ketoxime derivative represented by the formula



(I)

wherein R^1, R^2 and R^3 are as defined above.

2. A process for producing isoxazole derivatives as defined in claim 1 wherein R^1 and R^2 are each lower alkoxyl group.

3. A process for producing isoxazole derivatives as defined in claim 1 wherein the oxidation process is conducted by a process using an oxidizing reagent selected from potassium permanganate, manganese dioxide, potassium periodate, sodium periodate, ruthenium tetroxide, lead

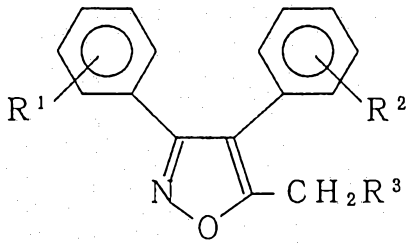
AUSTRALIAN PATENT OFFICE

tetracetate, mercury acetate, iron (Ⅲ) chloride, potassium hexacyanoferrate (Ⅲ), hydrogen peroxide solution or peracetic acid, an autoxidation process using air or oxygen, or an organic electrolytic oxidation process utilizing anodic oxidation.

AUSTRALIAN PATENT OFFICE

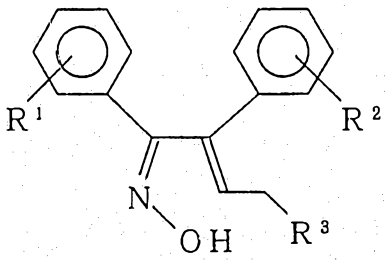
ABSTRACT

The present invention provides a process for producing isoxazole derivatives represented by the formula



(II)

wherein R^1 and R^2 are the same or different and are each a hydrogen atom or lower alkoxyl, and R^3 is cyano or alkoxycarbonyl, the process being characterized by oxidizing an α,β-unsaturated ketoxime derivative represented by the formula



(I)

wherein R^1, R^2 and R^3 are as defined above.

The isoxazole derivatives (II) to be produced by the process of the present invention are useful as intermediates for preparing (3,4-diarylisoxazol-5-yl)acetic acid derivatives which are useful as anti-inflammatory agents, analgesics and antipyretics.

AUSTRALIAN PATENT OFFICE

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP91/00064

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[5] C07D261/08

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	C07D261/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	EP, A, 26928 (CDC Life Sciences Inc.), April 15, 1981 (15. 04. 81), & JP, A, 56-59764	1-3
A	JP, A, 60-75471 (Taiho Pharmaceutical Co., Ltd.), April 27, 1985 (27. 04. 85)	1-3

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
March 29, 1991 (29. 03. 91)	April 15, 1991 (15. 04. 91)
International Searching Authority	**Signature of Authorized Officer**
Japanese Patent Office	

国　際　調　査　報　告

国際出願番号PCT/JP 91/ 00064

Ⅰ. 発明の属する分野の分類

国際特許分類（IPC）　Int. Cl[5]
C07D261/08

Ⅱ. 国際調査を行った分野

調　査　を　行　っ　た　最　小　限　資　料

分類体系	分類記号
IPC	C07D261/08

最小限資料以外の資料で調査を行ったもの

Ⅲ. 関連する技術に関する文献

引用文献のカテゴリー※	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	請求の範囲の番号
A	EP, A, 26928（CDC Life Sciences Inc.）, 15. 4月. 1981（15. 04. 81）, &JP, A, 56-59764	1－3
A	JP, A, 60-75471（大鵬薬品工業株式会社）, 27. 4月. 1985（27. 04. 85）	1－3

※引用文献のカテゴリー
「A」特に関連のある文献ではなく、一般的技術水準を示すもの
「E」先行文献ではあるが、国際出願日以後に公表されたもの
「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「O」口頭による開示、使用、展示等に言及する文献
「P」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「T」国際出願日又は優先日の後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「&」同一パテントファミリーの文献

Ⅳ. 認　　証

国際調査を完了した日	国際調査報告の発送日
29. 03. 91	15.04.91
国際調査機関	権限のある職員
日本国特許庁（ISA/JP）	特許庁審査官　植村慈樹　4C7624

様式PCT/ISA/210（第2ページ）（1981年10月）