

Patent Application

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(54) Title:

**PROCESS FOR PREPARATION OF DRONEDARONE BY
MESYLATION**

(57) Abstract:

The invention relates to a novel process for preparation of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]-benzoyl]-benzofuran-5-yl]methanesulfonamide (I) and pharmaceutical acceptable salts thereof, where a salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]phenyl}methanone of formula (II) - where A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), n is 1 if A is dibasic acid and n is 1 or 2 if A is a monobasic acid - is reacted with a mesylating reagent in a heterogen reaction, if desired, in the presence of a phase transfer catalyst. The invention also relates to the novel salts of compound of formula (II), for the preparation thereof and their use in the preparation of dronedarone.

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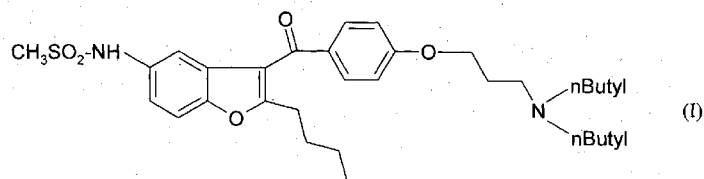
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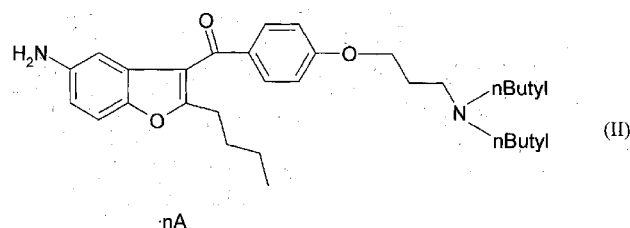
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(54) Title: PROCESS FOR PREPARATION OF DRONEDARONE BY MESYLATION



(I)



(II)

(57) Abstract: The invention relates to a novel
process for preparation of N-[2-n-butyl-3-[4-[3-
(di-n-butylamino)-propoxy]-benzoyl]-benzofur-
an-5-yl]methanesulfonamide (I) and pharma-
ceutical acceptable salts thereof, where a salt of
(5-amino-2-butyl-1-berizofuran-3-yl){4-[3-(di-n-
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mula (II) - where A is a mono- or dibasic acid
forming an acid addition salt with the compound
of formula (II), n is 1 if A is dibasic acid and n is
1 or 2 if A is a monobasic acid - is reacted with a
mesylating reagent in a heterogen reaction, if de-
sired, in the presence of a phase transfer catalyst.
The invention also relates to the novel salts of
compound of formula (II), for the preparation of
dronedarone.

Process for preparation of dronedarone by mesylation5 **FIELD OF THE INVENTION**

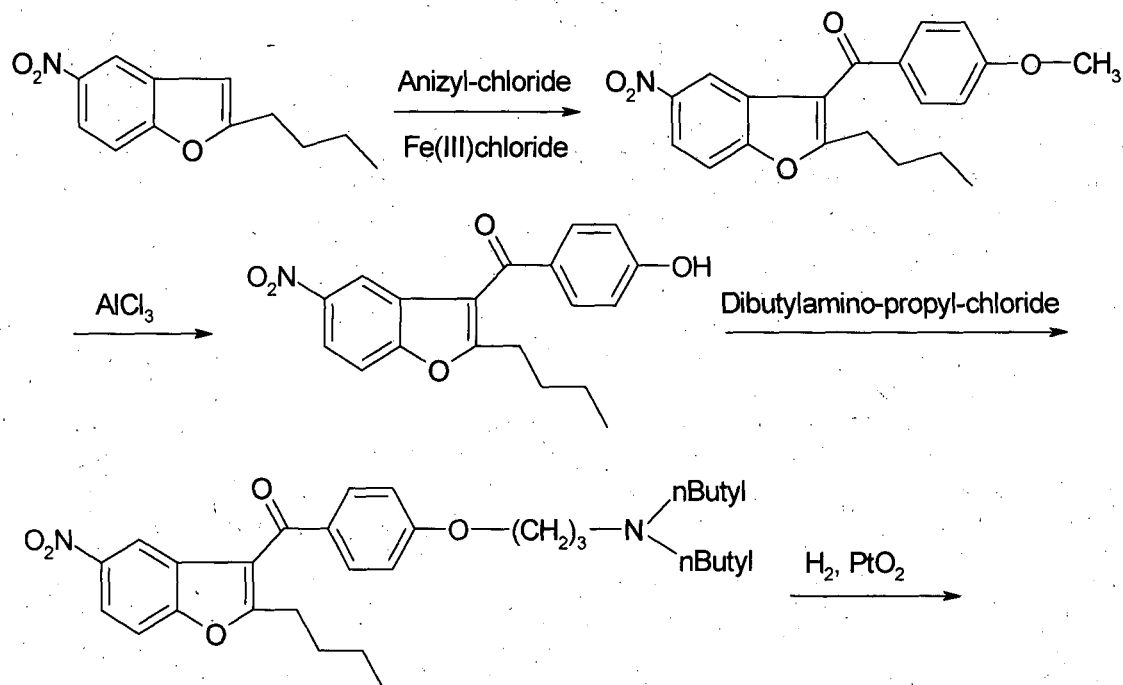
This invention relates to a novel process for the preparation of dronedarone and pharmaceutically acceptable salts thereof, to novel intermediary compounds used in this process and their preparation.

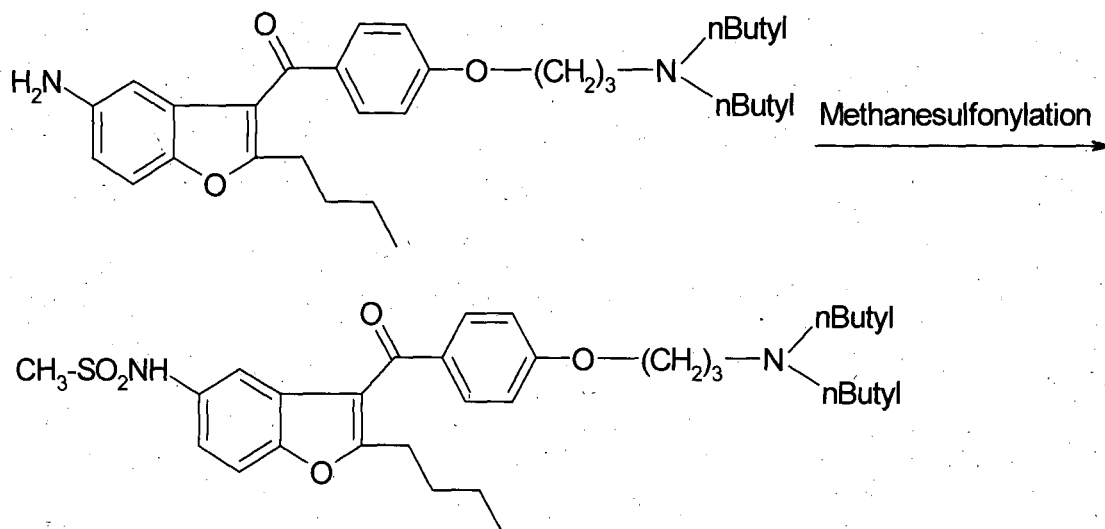
TECHNICAL BACKGROUND

10 Dronedarone is a known drug for the treatment of arrhythmia and has the chemical name of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]benzoyl]benzofuran-5-yl]methanesulfonamide [see also formula (I) below]. There are some known processes for the preparation of dronedarone as follows:

In EP 0471609 the following scheme is disclosed for the preparation of dronedarone

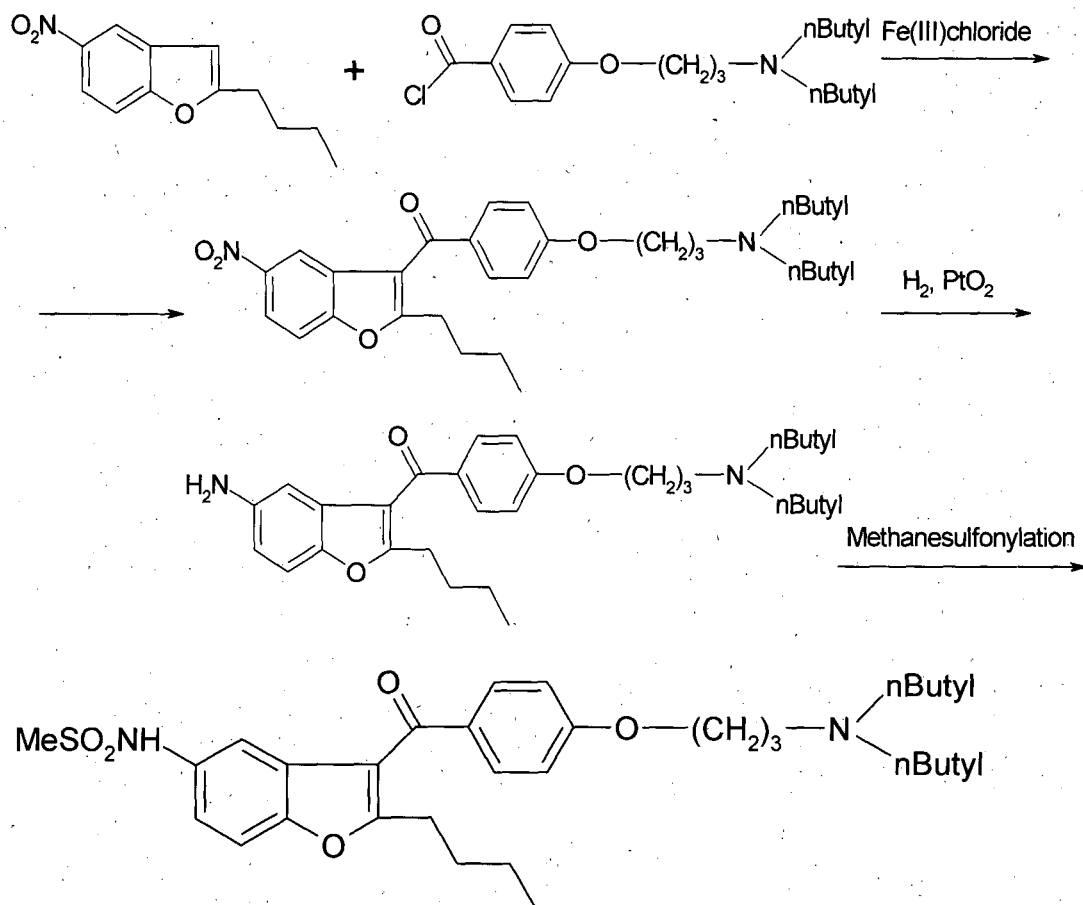
15 [Process A]





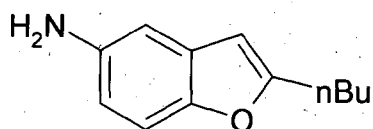
The above mentioned patent description discloses some new intermediary compounds, too.

5 In WO 02/48078 the following scheme is disclosed for the preparation of dronedarone
[Process B]:

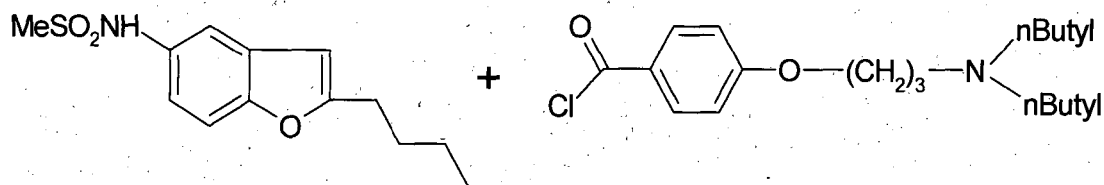


The novelty of the process is based on the adaptation of the Friedel-Crafts reaction in the first step. The process and the intermediary compounds used for the preparation of the benzoylchloride compound of the first step are also disclosed in this document. The further steps of the process are identical with the final steps of the synthetic route disclosed in EP 0471609 [Process A], but in the claims the whole synthetic route is claimed, up to dronedarone.

In WO 02/48132 (Sanofi) the following reaction route is disclosed [Process C]. This method is the so called superconvergent route. In the first step of it 5-amino-2-butyl-benzofuran



is mesylated and the obtained 2-butyl-5-methanesulfonamido-benzofuran (in HCl salt form) is further reacted in the next step as follows:



In this process the order of reaction steps are altered, the reduction and the methanesulfonylation steps are performed at the beginning of the procedure. Besides the reaction route for preparation of dronedarone, the starting material 2-butyl-5-methanesulfonamido-benzofuran and its preparation is also claimed.

From among the mentioned procedures the first one [Process A] is the so called linear synthesis. In this way of procedure the different parts of the dronedarone are stepwise built up on the starting compound. This method is the least economical because the step by step building of the chemical groups is performed where more and more complicated and expensive molecules are applied which rises the costs of preparation. Furthermore, it comprises complicated and dangerous reaction step because aluminium chloride is used in the cleaving reaction of the methoxy group which makes the industrial feasibility more complicated.

In WO 02/48078 (Process B) a shorter synthetic route is disclosed which makes this process more economical, but its last reaction step remained the methanesulfonylation reaction of the amino group. This reaction step (see the method described in example 6 of WO 02/48078) is complicated and give a low yield, only 61.6%. Pure product can be obtained after purification using chromatographic column purification, which method is necessary because of the separation difficulties of the bis-methanesulfonylated product.

The process disclosed in WO 02/48132 (process C) is simpler and more economical taken into consideration the number of the reaction steps. Unfortunately, in the last reaction step rather impure dronedarone.HCl (hydrochloride) is formed which is the obvious consequence of the presence of dibutylamino group in the Friedel-Crafts reaction. According to Examples 3 and 4, the crude dronedarone hydrochloride is prepared with a yield of 90 % which is further purified and finally the crude dronedarone base is produced with a yield of 86 %. This base is reacted with hydrogen chloride gas dissolved in isopropanol which results in pure dronedarone hydrochloride salt. No yield is given for this reaction step. According to example 5 crude dronedarone hydrochloride salt is prepared with a yield of 90%, which is washed with water and reacted with hydrogen chloride gas dissolved in isopropanol, resulting dronedarone hydrochloride salt again. The quality of this product is not known. However, neither the components used in the Friedel-Crafts reaction nor the resulted products and by-products are soluble in water, the washing step with water cannot result any purification apart from the removal of inorganic salts.

There is another drawback of this process, namely, a dimesylated side-product is formed in the mesylation reaction of the 5-amino-2-butyl-benzofuran. The purification is carried out by crystallization which has a yield of 78.5%.

It is known from example 3 of EP 0 471 609 (Process A) that the methanesulfonylation reaction of amino group in preparation of dronedarone is performed in dichloromethane solvent in presence of triethylamine as acid binding agent and using methanesulfonyl chloride as methanesulfonylating reagent. The reaction is performed at room temperature, probably, since the applied temperature is not given. The reaction time is 20 hours. The yield of crude dronedarone is 100% but pure dronedarone can be prepared from the crude material only with a yield of 61.6%. In another example the purification of crude dronedarone is made by hexane. The yield of this purification step is 56.5%. The purity of the obtained pure dronedarone is 96.1% (HPLC).

In example 35 of EP 0 471 609 (Process A) the methanesulfonylation reaction of 2-n-butyl-5-amino-benzofurane is disclosed. The solvent is carbon tetrachloride and triethylamine is applied as base and methanesulfonyl chloride is used as methanesulfonylating reagent in an amount of 3 equivalents. After 6 hours reaction time the 2-(bis-methanesulfonamido)-2-n-butyl-benzofurane [3] is separated.

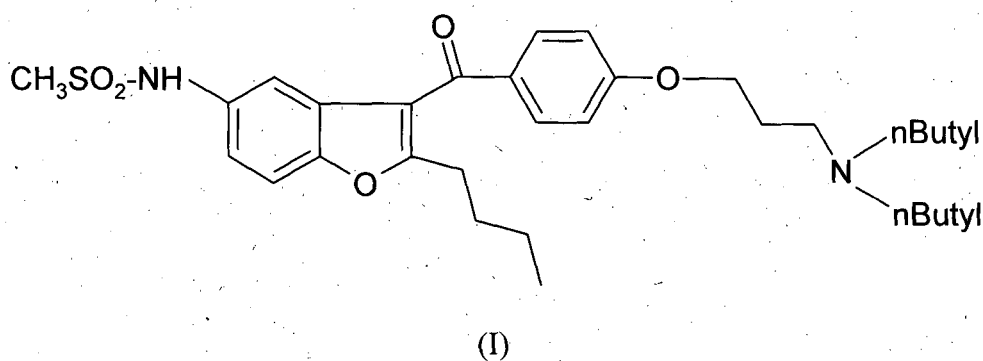
It is quite obvious from these two experiments that the selective mono-methanesulfonylation of the amino group is difficult and, according to example 3 mentioned before, beside the unreacted amino compound bis-methanesulfonylated compound (2) is also

present. This is the reason of the moderate yield of the purification of crude dronedarone and of the relatively low purity level of 96.1% (HPLC) (which disables the direct use of the obtained material for pharmaceutical purpose).

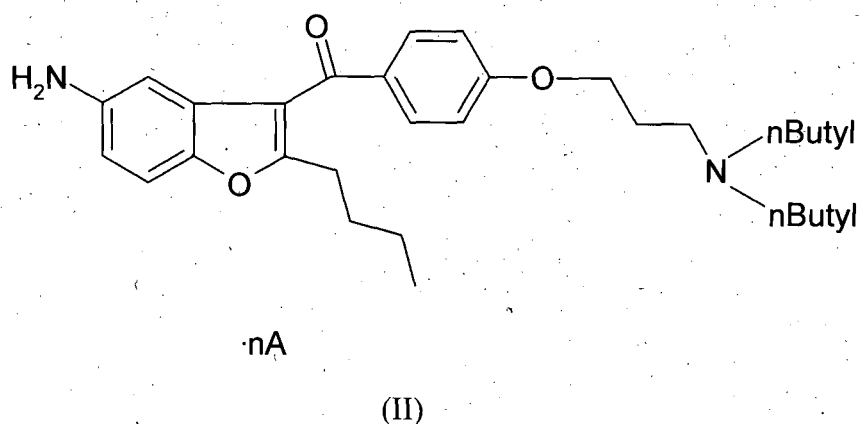
It is an object of present invention to provide a novel process for the preparation of dronedarone of formula (I), starting with known and commercially available materials, applying simple and environmentally compatible reagents and solvents to afford high overall yields and good purity of the product.

SUMMARY OF THE INVENTION

The main aspect of the invention is a novel process for preparation of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]-benzoyl]-benzofuran-5-yl]methanesulfonamide (dronedarone) (I)



and pharmaceutical acceptable salts thereof, in which a salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]phenyl}methanone of formula (II)



where

A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

is reacted with a mesylating reagent in a heterogen reaction, if desired, in the presence of a phase transfer catalyst.

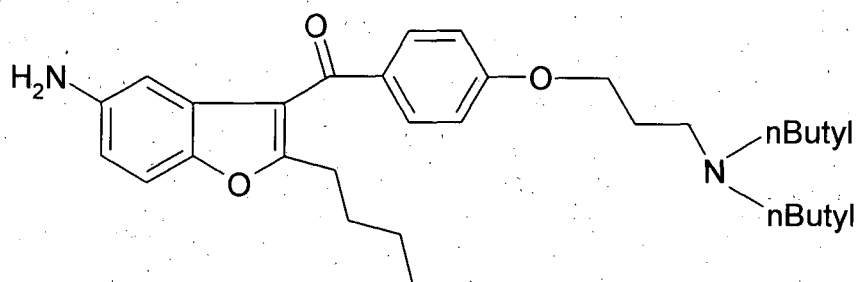
- 5 The obtained salt is separated, if desired, the free base form is delibared from it and, if desired, the obtained free compound is transformed into another salt.

The applicable acid for the preparation of pharmaceutically acceptable salts can be any inorganic or organic acid which forms an acid addition salt with the compound of general formula (I). Exemplary acids which can form an acid addition salt are as follows: acetic acid, 10 adipic acid, alginic acid, ascorbic acid, aspartic acid, benzoic acid, benzenesulfonic acid, methansulfonic acid, ethansulfonic acid, boric acid, butyric acid, citric acid, fumaric acid, hydrogen chloride, hydrogen bromide, hydrogen iodide, 2-hydroxyethanesulfonic acid, maleic acid, nitric acid, salicylic acid, tartaric acid, sulfuric acid (forming sulfate or bisulfate anion), sulfonic acid (such as those mentioned herein), succinic acid, toluenesulfonic acid and the like.

- 15 The hydrogen halogenide salts are typical, especially the hydrogen chloride salt.

Here it is mentioned that on the amide part of the mesylate group of the compound of general formula (I) (see the "left side" of the molecules) a salt formation can be carried out by a strong base, e.g. an alkaline hydroxide, typically by sodium hydroxide. However, these salts have less practical importance, but they are within the scope of salts which can be prepared by 20 the claimed process, i.e. the phrase "salts" embraces both the acid addition salts and the salts formed by bases (basic salts).

- 25 Another aspect of the invention relates to the novel intermediary salts of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]-phenyl}methanone of formula (II)



·nA

(II)

where

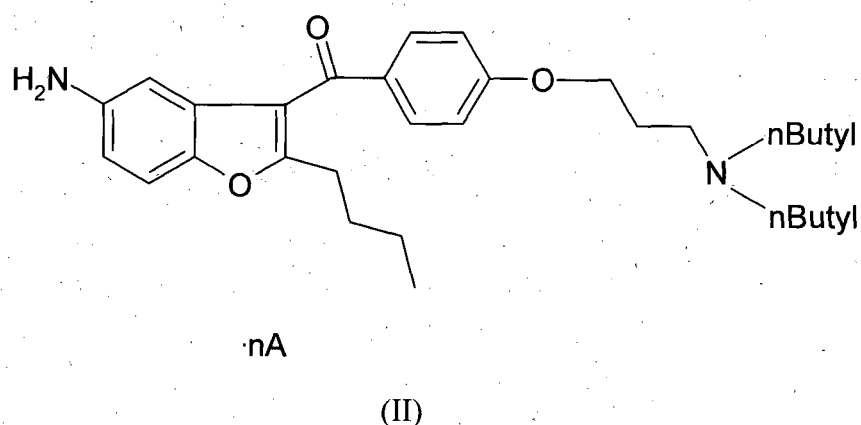
A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

with the proviso that A is different from oxalic acid.

A further aspect is a process for preparation of novel salts of compound of formula (II)



where

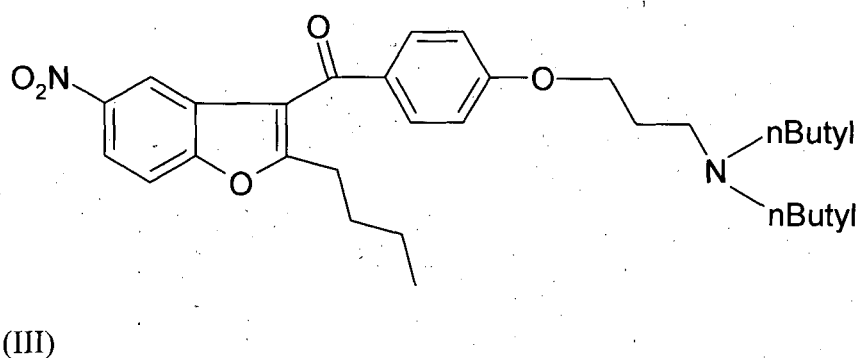
A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

with the proviso that A is different from oxalic acid,

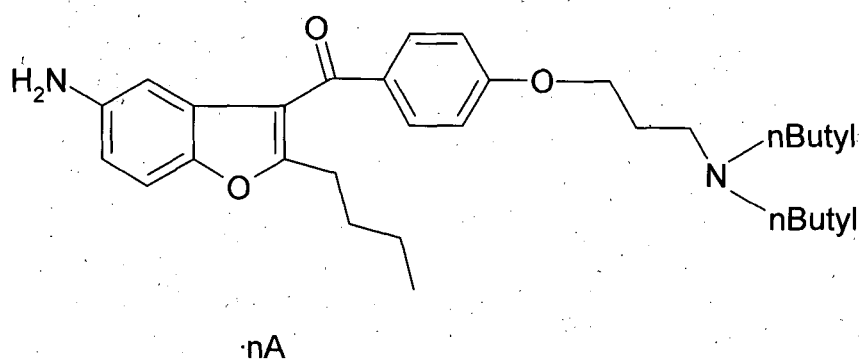
in which the nitro group of compound of formula (III)



is hydrogenated in a solvent in the presence of acid A.

A further aspect is the use of a salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]-phenyl}methanone of formula (II)

8



(II)

where

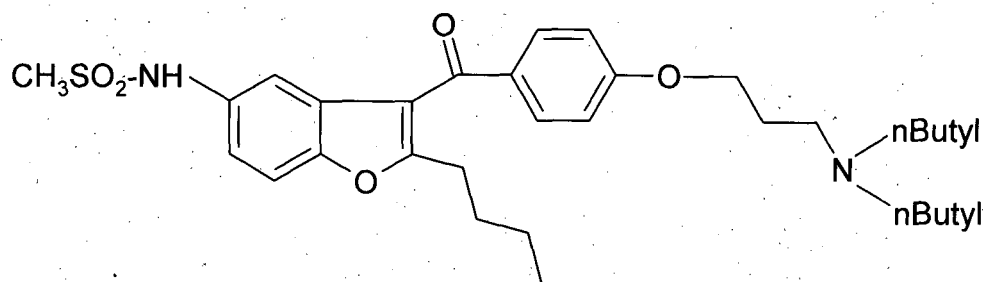
A is a mono- or dibasic acid forming an acid addition salt with the compound of formula

5 (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

for the preparation of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)-propoxy]-benzoyl]-benzofuran-5-yl]methanesulfonamide (I)



(I)

and pharmaceutical acceptable salts thereof. In this use the said compound of formula (II) is mesylated by reacting it with a mesylating reagent in a heterogen reaction, if desired, in the presence of a phase transfer catalyst.

15

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a new method to perform the mesylation reaction starting from the above new salts of compound of formula (II). This method is simple and practical; there is no need to use different amines for binding the acids produced in the mesylation reaction; moreover, using the new salts of compound of formula (II) negligible bis-mesylated product (<0.1%) is formed which makes unnecessary the material consuming purification for the removal of bis-mesylated product. The above salts of compound of formula (II) can be prepared in a simply way by mixing the base of formula (II) with one or two equivalents of desired acid.

The starting amine base of formula (II) is known from EP 0471609. The oxalate salt of compounds of formula (II) is also known from the Example 2 of EP 0471609 which can be applied for the purification of compounds of formula (II). Other salts are not known from the prior art. However, moderate yields and purity can be achieved by the use of the oxalate salt in the invented process (i.e. it is not an advantageous embodiment).

Without binding ourselves to the following theory, we suppose that the heterogeneous character of the reaction plays an important role in the selectivity of the mesylation reaction (selectivity for the preparation of mono-mesylated product). In this process the salt form of the compound of formula (II) is not soluble in the applied inert solvent (which can be a solvent mixture, too), but the base form and the dissociated acid (acid A) is soluble in the applied solvent (where the mesylating compound is also solved). We suppose that after the formation of the mono-mesylated compound a salt formation takes place at the di-N-alkylated amino group (see the "right side" of the molecule) and the formed salt leaves the inert solvent, and it hinders the formation of the di-mesylated product. This theory gives an explanation for the found surprising selectivity for the mono-mesylation.

The phrases "insoluble" or "does not solve" have the general meaning applied in the field of chemistry, i.e. refers to a very poor solubility (less than 0.1 or 0.01 % or 0.001 by weight solution can be made from the substance) since a minimal solubility obviously cannot be excluded theoretically. The phrases "soluble" and "can be solved" refers to a much better solubility (more than 0.1, e.g. more than 1 % by weight solution can be made from the substance).

The applicable acid can be any inorganic or organic acid which forms an acid addition salt with the compound of general formula (II). Exemplary meanings of acid A are as follows: acetic acid, adipic acid, alginic acid, ascorbic acid, aspartic acid, benzoic acid, benzenesulfonic acid, methanesulfonic acid, ethanesulfonic acid, boric acid, butyric acid, citric acid, ethanesulfonic acid, fumaric acid, hydrogen chloride, hydrogen bromide, hydrogen iodide, 2-hydroxyethanesulfonic acid, maleic acid, methanesulfonic acid, nitric acid, salicylic acid, tartaric acid, sulfuric acid (forming sulfate or bisulfate anion), sulfonic acid (such as those mentioned herein), succinic acid, toluenesulfonic acid and the like. The hydrogen halogenide salts are typical, especially the hydrogen chloride salt. Moreover, methanesulfonic acid and p-toluenesulfonic acid salts are also practical.

The reaction is carried out typically at temperature of 50-140°C, e.g. 65 to 100 °C, typically under atmospheric pressure.

The heterogeneous character of the reaction can be ensured by the proper selection of the solvent applied in the reaction. Such solvent should be applied in which the salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]phenyl}-methanone of formula (II) is not soluble but the base form of it and the acid A are soluble. Otherwise the solvent should be inert, i.e. it must not react with any reagent applied in the process.

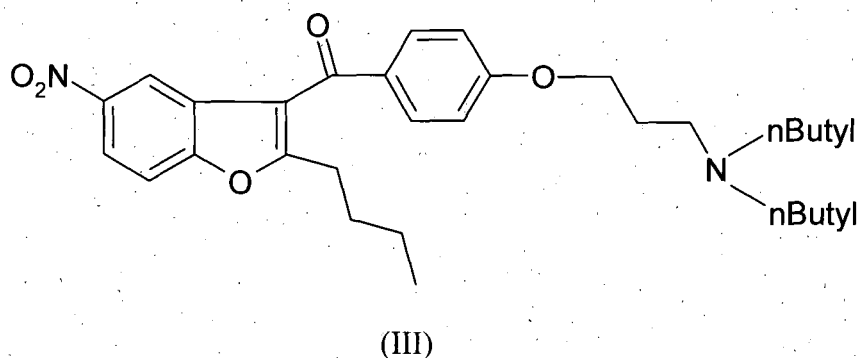
In one embodiment the solvent is selected from the group of aromatic compounds, halogenated aromatic compounds, halogenated alkenes or cycloalkanes, ethers and ketones and any mixtures thereof. Typically the solvent is selected from the group of toluene, xylene, chlorobenzene, anisole, dichloroethane, heptane, 2-methyl cyclohexane, dibutylether, methylethyl ketone and any mixtures thereof.

In the process a mesylating reagent should be applied. It can be any reagent which can be used for inserting a CH_3SO_2- group into the free amino group of compound of general formula (II) [see the "left side" of general formula (II)]. It is advantageous to use methanesulfonic anhydride or methanesulfonyl halogenide, e.g. methanesulfonyl chloride.

With respect to the heterogeneous character of the invented process, it is advantageous to apply a phase transfer catalyst. This phrase is obvious for a skilled person and embraces such substances which enables the dissolution of the base form compound of formula (II) into the applied inert solvent. The phase transfer catalyst is typically a quaternary ammonium salt, e.g. quaternary ammonium chloride.

The salts of compound of formula (II) can be prepared by known procedures. Typically the (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(dibutylamino)propoxy]phenyl}-methanone of formula (II) is reacted with 1 or 2 equivalents of acid A (which is typically hydrogen chloride, hydrogen bromide, methanesulfonic acid, p-toluenesulfonic acid, e.g. hydrogen chloride). The reaction is carried out in a usual inert solvent (or solvent mixture) and the obtained salt is separated (if desired, it can be further purified by known purification methods).

In another embodiment of the invention the salts of compound of formula (II) can be prepared by reducing (hydrogenating) the nitro group of compound of formula (III)



in presence of 1 or 2 equivalents of acid A (see above). The obtained product can be used in the mesylation step without further purification.

The above reduction is a hydrogenation process which is carried out in a solvent usually applied in hydrogenation methods (typically C₁₋₄ alcohols (e.g. methanol and ethanol), ethyl acetate, cyclohexane) in presence of usual catalyst generally used for hydrogenation (e.g. Pd or Pt catalyst, especially for hydrogenation of a nitro group, e.g. Pd/C).

Accordingly, the dronedarone (I) and pharmaceutical acceptable salts thereof can be prepared by a process wherein the compound of formula (III) is hydrogenated in a solvent (or solvent mixture) in the presence of an acid A (see above, which is typically hydrochloric acid, hydrobromic acid or methanesulfonic acid), and after completion of the reaction the catalyst is filtered out, the solvent is removed and the residual salt of formula (II) is reacted in another solvent with a mesylating reagent (as it is discussed above), the obtained salt of dronedarone of formula(I) is separated and, if desired, the base form of dronedarone of formula(I) is deliberated and, if desired, another salt thereof is formed.

Examples

Example 1

N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]benzoyl]benzofuran-5-yl]methanesulfonamide (I)

1 g of (5-amino-2-butyl)-1-benzofuran-3-yl)[4-[3-(di-n-butylamino)propoxy]-phenyl]-methanone dihydrochloride salt and 0,12 g of tetrabutylammonium chloride is added to 10 ml of toluene. It is heated under stirring to 80-90 °C and at this temperature 0.41 g of methanesulfonyl chloride is added in 30 minutes. The mixture is stirred at 80-90 °C for 5 hours. The mixture is cooled to room temperature and 10 ml of ethyl acetate and 10 ml of water are added. The organic layer is separated and the aqueous layer is extracted with 5 ml of ethyl acetate. The combined organic layers are dried on Na₂SO₄ and evaporated.

Yield: 1.07 g (99.5 %).

This product is purified by forming its oxalate salt as follows: to the residue 4 ml of methylethyl ketone is added and the mixture heated to 70 °C . To this solution 0.22 g of oxalic acid dissolved in 2.5 ml of methylethyl ketone is added at 70° C. After cooling to 20 °C in 6 hours the mixture is stirred at 10 °C for 1 hour and filtered. To the obtained oxalate salt 3.5 ml of water and 5 ml of dichloromethane and 0.59 g of potassium carbonate are added. After stirring

for 30 minutes the separated potassium oxalate is filtered and washed with 3 ml of dichloromethane and the solvent is evaporated.

Mass of purified product 0.98 g (92 %).

Purity of the obtained title product: 99.8 % (HPLC).

HNMR (DMSO): 0.8-0.9ppm (m,9H); 1.2-1.5pp (m, 10H); 1.67ppm (5',2H); 1.87ppm (5',2H); 2.38ppm (t, J=7.2Hz, 4H); 2.57ppm (m,2H); 2.81ppm (t, J=7.5Hz, 2H); 2.91ppm (s, 3H); 4.15ppm (t, J=6.2Hz, 2H); 7.09ppm (d, J=8.8Hz, 2H); 7.24ppm (dd, J=8.9, 2.2Hz, 1H); 7.34ppm (d, J=2.1Hz; 1H); 7.65ppm (d, J=8.8Hz, 1H); 7.81ppm (d, J=8.8Hz, 2H)

Example 2

The process according to example 1 is performed with the difference that chlorobenzene is used instead of toluene.

Yield of the product after purification through its oxalate salt according to example 1: 94.6%. Purity (HPLC): 99.7 %.

Example 3

The process according to example 1 is performed with the difference that 0.04 g of tetramethyl ammonium chloride is used instead of tetrabutyl ammonium chloride.

Yield of the product after purification through its oxalate salt according to example 1: 95.1 %. Purity (HPLC): 99.6 %.

Example 4

N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]benzoyl]benzofuran-5-yl]methanesulfonamide (I)

0.9 g of (5-amino-2-butyl)-1-benzofuran-3-yl[4-[3-(di-n-butylamino)propoxy]-phenyl]methanone is dissolved in 10 ml of dichloromethane. 0.37 g of methanesulfonic acid is added in 5 minutes and the mixture is stirred for 5 minutes. The solvent is evaporated. To the residual salt mixed with 10 ml of heptane and 0.11 g of triethylbenzyl ammonium chloride is added and the mixture is heated to 80-90 °C. At this temperature 0.62 g of methansulfonic anhydride is added in 5 minutes and the mixture is stirred at this temperature for additional 5 hours. After cooling to room temperature 15 ml of ethyl acetate and 1 ml of sodium hydrocarbonate (5%) is added. The organic layer is washed with 5 ml of water and evaporated.

Yield: 0.98 g (94.8 %). This product is purified through its oxalate salt according to example 1 (yield: 90.6%). Purity of the obtained title product (HPLC): 99.8 %.

Example 5

N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]benzoyl]benzofuran-5-yl]methanesulfonamide (I)

4.8 g of (5-amino-2-butyl)-1-benzofuran-3-yl[4-[3-(di-n-butylamino)propoxy]-phenyl]methanone is dissolved in 15 ml of abs. ethanol and 0.9 ml of hydrochloric acid of 37% is added in 10 minutes. The solution is stirred at 50 °C for 30 minutes and completely evaporated in reduced pressure. The residual material: 5.1 g (99 %) (5-amino-2-butyl)-1-benzofuran-3-yl[4-[3-(di-n-butylamino)propoxy]phenyl]-methanone monohydrochloride salt.

To this salt 0.5 g of tetrabutylammonium chloride and 50 ml of toluene are added and heated to 80-90 °C. At this temperature 1.9 g of methanesulfonyl chloride is added in 30 minutes. This mixture is stirred at 80-90 °C for 5 hours and cooled to room temperature. 50 ml of ethylacetate and 50 ml of water are added and the phases are separated. The aqueous layer is washed with 25 ml of ethyl acetate. The combined organic layer is dried with Na₂SO₄ and evaporated.

Yield: 5.4 g (99 %). This product is purified through its oxalate salt according to example 1 (yield: 87 %). Purity of the obtained title product (HPLC): 99.7%.

The product is identical with the compound prepared in Example 1.

Example 6

(5-amino-2-butyl-1-benzofuran-3-yl)[4-[3-(di-n-butylamino)propoxy]phenyl]-methanone dihydrochloride (II)

4.8 g of (5-amino-2-butyl)-1-benzofuran-3-yl[4-[3-(di-n-butylamino)propoxy]-phenyl]methanone is dissolved in 15 ml of abs. ethanol and 1.8 ml of hydrochloric acid of 37% is added in 10 minutes. The solution is stirred at 50 °C for 30 minutes and completely evaporated in reduced pressure. The residual foam solidified cool.

Mp.: 81.5-82.1 °C

Yield: 5.5 g (99%). Purity (HPLC): 99.8 %.

¹HNMR (DMSO): 7.8ppm (d, J=8.7Hz, 2H); 7.78ppm (d, J=8.93Hz, 1H); 7.47ppm (d, J=2.29Hz, 1H); 7.36ppm (dd, J=8.81 2.17Hz, 1H); 7.11ppm (d, J=8.93Hz, 2H); 4.21ppm (t, J=6.07Hz, 2H); 3.17-3.25ppm (m, 2H); 3.01-3.09ppm (m, 4H); 2.80ppm (t, J=7.75Hz, 2H);

2.17-2.25ppm (m, 2H); 1.62-1.71ppm (m, 6H); 1.33ppm (sxt, J=7.42Hz, 4H) 1.22ppm (sxt, J=7.42Hz, 2H), 0.91ppm (t, J=7.32Hz, 6H); 0.79ppm (t, J=7.44Hz, 3H)

Molecular mass: $[M+2H]^{2+}_{\text{measured}} = 240.1657 \text{ Da}$; $[M+2H]^{2+}_{\text{calc}} = 240.1676 \text{ Da}$.

5 Example 7

(5-amino-2-butyl)-1-benzofuran-3-yl)[4-[3-(di-n-butylamino)propoxy]phenyl]-methanone dihydrochloride (II)

5.08 g of (2-n-butyl-5-nitro-1-benzofuran-3-yl)[4-(di-n-butylamino)propoxy]-phenyl]methanone (III) is dissolved in 50 ml of ethanol and 0.3 g of Pd/C (10 %) is added.
10 Under stirring 1.8 ml of hydrochlorid acid (37%) is added to the mixture and heated to 50 °C and is set under H₂ pressure of 10 bar. After 4 hours reaction time the mixture is cooled down to room temperature, the catalyst is filtered and the solvent is evaporated under reduced pressure.

Yield: 5.5 g (99 %). Purity of product (HPLC): 97.6 %.

The product is identical with compound prepared in Example 6

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Example 8

N-[2-n-butyl-3-[4-[3-(di-n-butylamino)propoxy]benzoyl]benzofuran-5-yl]methanesulfonamide (I)

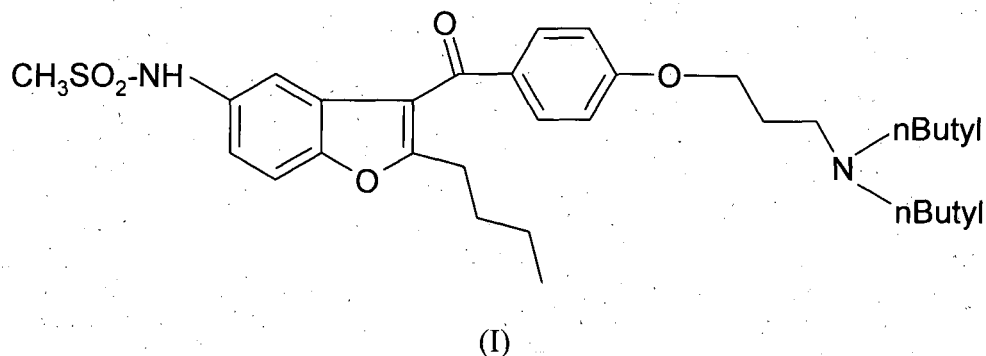
5.08 g of (2-n-butyl-5-nitro-1-benzofuran-3-yl)[4-(di-n-butylamino)propoxy]-phenyl]methanone (III) is dissolved in 50 ml of ethanol and 0.3 g of Pd/C (10 %) and 1.8 ml of hydrochlorid acid (37 %) are added. Under stirring the mixture is heated to 50 °C and is set under H₂ pressure of 10 bar. After 4 hour reaction time at 50 °C the mixture is cooled down to room temperature, the catalyst is filtered and the solvent is evaporated under reduced pressure.
25 To the residual salt 50 ml of toluene and 4.8 g of tetramethylammonium chloride are added and the mixture is heated to 80-90 °C. At this temperature 2.25 g of methansulfonyl chloride is added in 30 minutes and the mixture is stirred at this temperature for 6 hours. After cooling down to 25 °C 60 ml of isopropyl acetate and 25 ml of aq. sodium hydrocarbonate of 5 % are added and stirred for 10 minutes. The phases are separated. The organic layer is washed with 10 ml of water. After drying on Na₂SO₄ the solvent is evaporated.

30 Yield: 5.5 g (99.1 %). The product is purified by its oxalate salt according to example 1 (yield: 94 %). Purity of the obtained title product: 99.7 % (HPLC).

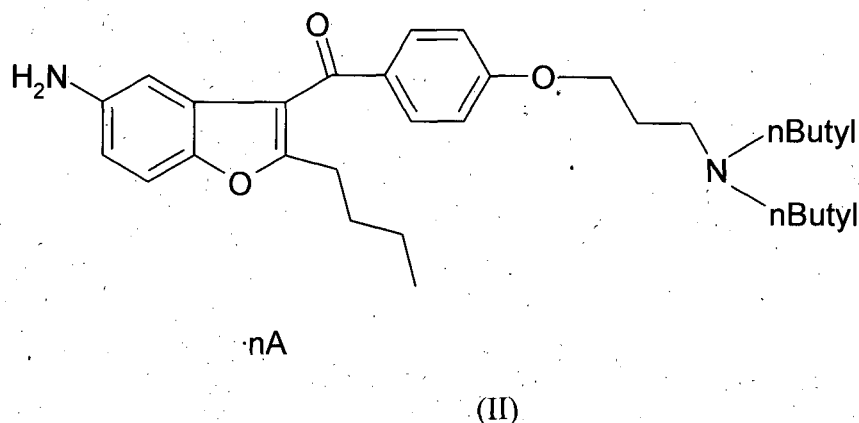
The product is identical with compound prepared in example 1.

Claims

1. Process for preparation of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)-propoxy]-benzoyl]-benzofuran-5-yl]methanesulfonamide (I)



and pharmaceutical acceptable salts thereof, characterized in that a salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]phenyl}methanone of formula (II)



where

A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

is reacted with a mesylating reagent in a heterogen reaction, if desired, in the presence of a phase transfer catalyst.

2. Process according to claim 1, characterized in that the acid A is selected from the group of hydrogen chloride, hydrogen bromide, methanesulfonic acid, p-toluenesulfonic acid and sulphuric acid.

3. Process according to claim 2 characterized in that a solvent is applied in which the salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]phenyl}-methanone of formula (II) is not soluble and the base form of it and acid A are soluble.

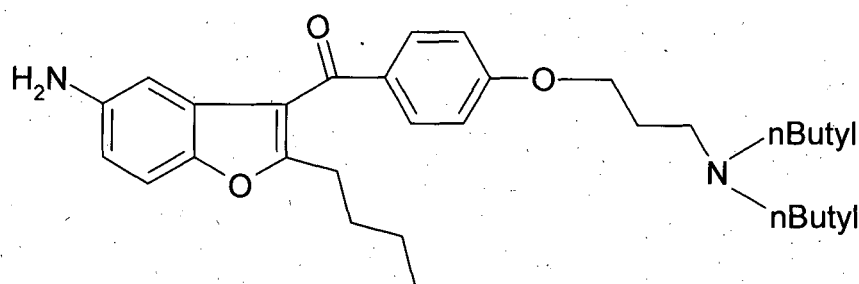
4. Process according to claim 3, characterized in that the solvent is selected from the group of aromatic compounds, halogenated aromatic compounds, halogenated alkenes or cycloalkanes, ethers and ketones and any mixtures thereof.

5. Process according to claim 4, characterized in that solvent is selected from the group of toluene, xylene, chlorobenzene, anisole, dichloroethane, heptane, 2-methyl cyclohexane, dibutylether, methylethyl ketone and any mixtures thereof.

6. Process according to any of claims 1 to 5, characterized in that the mesylating agent is methanesulfonic anhydride or methanesulfonyl halogenide.

7. Process according to any of claims 1 to 6, characterized in that the reaction is carried out in the presence of a phase transfer catalyst.

8. A salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]-phenyl}methanone of formula (II)



$\cdot nA$

(II)

where

A is a mono- or dibasic acid forming an acid addition salt with the compound of formula (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

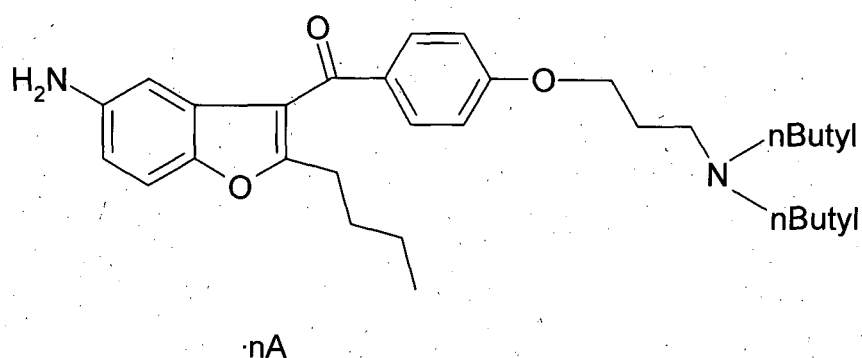
with the proviso that A is different from oxalic acid.

9. A salt according to claim 8, wherein A is selected from the group of hydrogen chloride, hydrogen bromide, methanesulfonic acid, p-toluenesulfonic acid and sulphuric acid.

10. A salt according to claim 8, wherein A is hydrogen chloride and n is 2.

11. Process for preparation of the salt of compound of formula (II)

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(II)

where

A is a mono- or dibasic acid forming an acid addition salt with the compound of formula

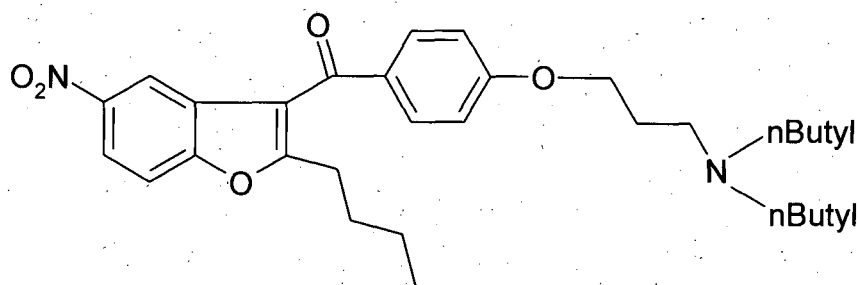
5 (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

with the proviso that A is different from oxalic acid,

characterized in that the nitro group of compound of formula (III)



(III)

is hydrogenated in a solvent in the presence of acid A.

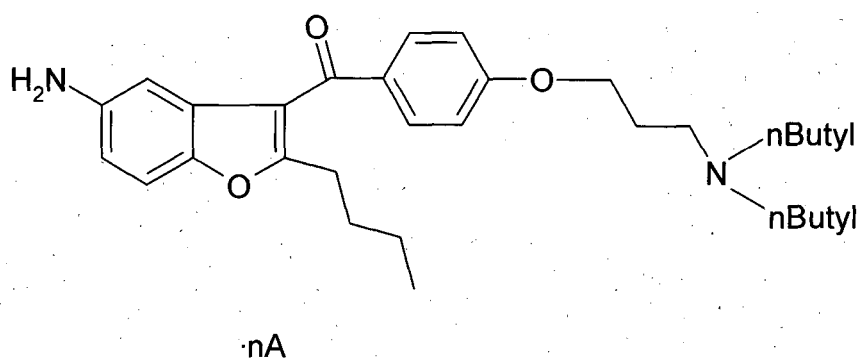
12. The process according to claim 11, characterized in that the acid A is selected from the group of hydrogen chloride, hydrogen bromide, methanesulfonic acid, p-toluenesulfonic acid and sulphuric acid.

13. The process according to claim 11 or 12, characterized in that the hydrogenation process is carried out in a solvent in the presence of Pd or Pt catalyst.

14. The process according to claim 13, characterized in that the solvent is selected from the group of C₁₋₄ alcohols, ethyl acetate and cyclohexane.

15. Use of a salt of (5-amino-2-butyl-1-benzofuran-3-yl){4-[3-(di-n-butylamino)propoxy]-phenyl}methanone of formula (II)

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(II)

where

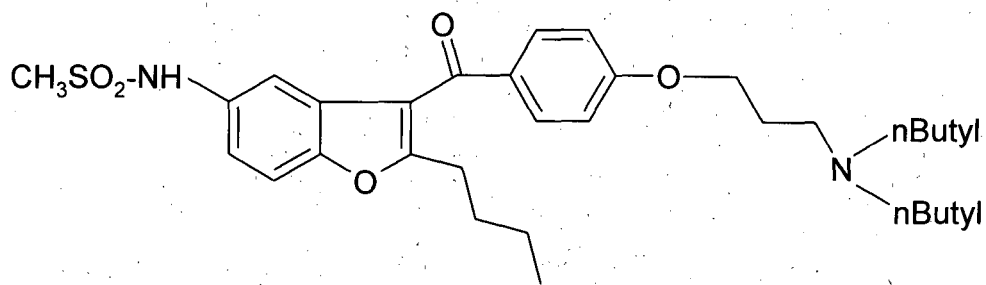
A is a mono- or dibasic acid forming an acid addition salt with the compound of formula

5 (II), and

n is 1 if A is dibasic acid, and

n is 1 or 2 if A is a monobasic acid,

for the preparation of N-[2-n-butyl-3-[4-[3-(di-n-butylamino)-propoxy]-benzoyl]-benzofuran-5-yl]methanesulfonamide (I)



(I)

10

and pharmaceutical acceptable salts thereof.