

DESCRIPTION

PROCESS FOR PURIFYING PHENOLS

5

TECHNICAL FIELD

The present invention relates to a process for purifying phenols, which comprises removing the impurities in an acid decomposition product obtained by acid
10 decomposition of alkylaryl hydroperoxide to produce high purity phenols.

The present invention also relates to a process for purifying phenols, which comprises removing the impurities in crude phenol obtained from an acid decomposition product
15 of cumene hydroperoxide to produce high purity phenol.

BACKGROUND ART

Phenols are produced through a step of oxidizing
20 alkylbenzene to alkylaryl hydroperoxide, a step of concentrating an oxidation reaction product of alkylbenzene, a step of subjecting the concentrated solution to the cleavage reaction into phenols and ketone with an acid catalyst, a step of neutralizing the acid cleavage product,
25 and a step of separating the acid cleavage product by

distillation.

As a process for producing phenols, for example, a process for acid decomposition of cumene hydroperoxide obtained by oxidation of cumene is well known. The acid decomposition product in this process contains, in addition to phenol and acetone as main components, various by-products such as α -methylstyrene, acetophenone, cumylphenol, α -dimethylphenyl carbinol and unreacted cumene, and various carbonyl compounds such as a trace amount of hydroxyacetone (HA) and α -phenylpropionaldehyde (α -PPA). For the applications of phenol, mention may be made of uses as raw materials for producing diphenylpropane, polycarbonate, or the like, but for such the raw materials, high purity phenol is required.

For such high purity phenol, it is necessary that the content of hydroxyacetone (HA) as an impurity is reduced to 30 ppm or less, and preferably 10 ppm or less. In addition, it is necessary that the total amount of other aliphatic and aromatic carbonyl compounds contained (total carbonyls other than HA) is reduced to 100 ppm or less, and preferably 50 ppm or less.

In order to obtain such high purity phenol, purification is carried out, wherein most of the low-boiling substances such as acetone, cumene, water and α -methylstyrene, and most of the high-boiling substances such

as acetophenone and α -dimethylphenyl carbinol are removed from a neutralization product of the acid decomposition product by means of fractional distillation to give a phenol fraction, and further the aliphatic carbonyl compounds such as hydroxyacetone (HA), and the aromatic carbonyl compounds such as α -phenylpropionaldehyde (α -PPA) are removed from the phenol fraction.

However, it is particularly difficult to remove these carbonyl compounds from phenol, which thus deteriorates the quality of phenol as a product.

For a conventional process for purifying high purity phenol, for example, JP-B No. 37-11664 (Patent Document 1) proposes a process in which hydroxyacetone and phenol are subjected to react by bringing crude phenol (content of hydroxyacetone: 200 ppm) into contact with an activated alumina catalyst at 360°C to give 2-methylbenzofuran (2-MBF), and phenol and 2-methylbenzofuran are then separated by means of steam distillation. In addition, JP-B No. 54-1289 (Patent Document 2) discloses a process in which activated alumina is used for the purification of cresol.

In addition, JP-B No. 42-12250 (Patent Document 3) proposes a process which comprises bringing crude phenol into contact with a silica/alumina catalyst at 150 to 250°C to convert a carbonyl compound to another compound, and separating the compound and phenol by distillation.

Moreover, GB Patent No. 1231991 (Patent Document 4) proposes a process which comprises bringing crude phenol containing no water into contact with an acidic ion exchange resin catalyst at 80 to 150°C to convert a carbonyl compound to another compound, and then separating the compound and phenol by distillation.

However, the above processes incurred problems such that phenol and α -methylstyrene which are useful components in the crude phenol react with the impurities, or they are condensed with each other to produce cumylphenol or olefin dimers, and thus the useful components are lost, or the like.

[Patent Document 1] JP-B No. 37-11664

[Patent Document 2] JP-B No. 54-1289

[Patent Document 3] JP-B No. 42-12250

[Patent Document 4] GB Patent No. 1231991

DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide a process for purifying phenols, which comprises bringing an acid decomposition product of alkylaryl hydroperoxide or crude phenol obtained from an acid decomposition product of cumene hydroperoxide into contact with a Group VB or Group VIIB metal oxide which shows a characteristic activity to the impurities contained therein, to convert a carbonyl

compound as an impurity to a high-boiling compound without causing the loss of the useful components, under mild reaction conditions, and separating the high-boiling compound and phenols by distillation to produce high purity phenols, in order to solve the above described problems in the conventional processes.

That is to say, according to a first aspect of the invention, provided is a process for purifying phenols, which comprises bringing an acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide into contact with a Group VB or Group VIIB metal oxide, to convert the aliphatic carbonyl compounds and/or the aromatic carbonyl compounds in the acid decomposition product of alkylaryl hydroperoxide to higher-boiling compounds, and then separating the high-boiling compounds and phenols by distillation.

Further, according to a second aspect of the invention, provided is a process for purifying phenols as described in the first aspect of the invention, which comprises adding an aqueous alkaline solution to an acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide, and bringing the acid decomposition product into contact with at least one metal oxide selected from Group VB and Group VIIB metal oxides in the coexistence of an oxygen-containing gas, to convert the aliphatic carbonyl compounds

and/or the aromatic carbonyl compounds in the acid decomposition product of alkylaryl hydroperoxide to higher-boiling compounds, subsequently neutralizing the reaction solution, and then separating the high-boiling compounds and
5 phenols by distillation.

In addition, according to a third aspect of the invention, provided is a process for purifying phenols as described in the first or second aspect of the invention, wherein the alkylaryl hydroperoxide is at least one selected
10 from cumene hydroperoxide, ethylbenzene hydroperoxide, secondary butylbenzene hydroperoxide, cymene hydroperoxide and diisopropylbenzene hydroperoxide.

Moreover, according to a fourth aspect of the invention, provided is a process for purifying phenols as described in
15 any one of the first to third aspects of the invention, wherein the alkylaryl hydroperoxide is cumene hydroperoxide, and the phenol is phenol.

Further, according to a fifth aspect of the invention, provided is a process for purifying phenols as described in
20 any one of the second to fourth aspects of the invention, wherein the aqueous alkaline solution is at least one selected from an aqueous sodium hydroxide solution and an aqueous solution of sodium phenoxides.

Further, according to a sixth aspect of the invention,
25 provided is a process for purifying phenols as described in

any one of the second to fifth aspects of the invention, wherein an effective amount of the aqueous alkaline solution is added such that pH of the acid decomposition product is maintained in the range of about 4 to 12.

5 Further, according to a seventh aspect of the invention, provided is a process for purifying phenols as described in any one of the first to sixth aspects of the invention, wherein the acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide is brought into
10 contact with at least one metal oxide selected from Group VB and Group VIIB metal oxides at a temperature of 50 to 150°C.

Further, according to an eighth aspect of the invention, provided is a process for purifying phenols as described in the first aspect of the invention, which comprises bringing
15 crude phenol obtained from an acid decomposition product of cumene hydroperoxide into contact with a Group VB or Group VIIB metal oxide catalyst, to convert the aliphatic carbonyl compounds in crude phenol to higher-boiling compounds, and then separating the high-boiling compounds and phenol by
20 distillation.

Further, according to a ninth aspect of the invention, provided is a process for purifying phenols as described in the eighth aspect of the invention, wherein the crude phenol and the metal oxide catalyst are brought into contact at a
25 temperature of 100 to 250°C for 30 to 180 minutes.

Further, according to a tenth aspect of the invention, provided is a process for purifying phenols as described in any one of the first to ninth aspects of the invention, wherein the Group VB or Group VIIB metal oxide is metal
5 oxide selected from the group consisting of vanadium, niobium, tantalum, manganese and rhenium.

Further, according to an eleventh aspect of the invention, provided is a process for purifying phenols as described in any one of the first to tenth aspects of the
10 invention, wherein the separation of phenols from the reaction products after the contact with metal oxide by distillation is steam distillation or extractive distillation with organic solvent.

According to the process of the present invention, by
15 bringing an acid decomposition product of alkylaryl hydroperoxide into contact with a specific metal oxide, the aliphatic carbonyl compounds and/or the aromatic carbonyl compounds, which are contained as the impurities, can be converted to high-boiling compounds while suppressing the
20 loss of phenols and alkenyl benzenes which are the useful components, under mild reaction conditions.

Further, according to the process of the present invention, by bringing crude phenol obtained from an acid decomposition product of cumene hydroperoxide into contact
25 with a specific metal oxide, the aliphatic carbonyl

compounds, which are contained as the impurities, can be converted to high-boiling compounds while suppressing the loss of phenol and α -methylstyrene which are the useful components, under mild reaction conditions.

5 Thus, high purity phenols can be produced easily by separating phenols by distillation from the above high-boiling compounds.

BEST MODE FOR CARRYING OUT THE INVENTION

10 The acid decomposition product to be purified according to the invention is, for example, the product from acid decomposition of cumene hydroperoxide obtained by oxidation reaction of cumene, and its composition is as follows.

15	Acetone	29.0 to 46.1%
	Phenol	47.0 to 36.0%
	Cumene	11.1 to 7.8%
	α -methylstyrene	4.5 to 1.2%
	Others	8.4 to 8.9 wt%

20 Further, the crude phenol to be purified according to the invention is one which is obtained by acid decomposition of cumene hydroperoxide obtained by oxidation reaction of cumene, and then distilled to remove most of the low-boiling substances such as acetone, cumene, water and α -

25 methylstyrene, and most of the high-boiling substances such

as acetophenone and α -dimethylphenyl carbinol from a neutralization product of the above acid decomposition product by fractional distillation. The content of α -methylstyrene in crude phenol is preferably 15% by weight or less.

The acid decomposition product or crude phenol as described above includes hydroxyacetone (HA), other aliphatic carbonyls or aromatic carbonyls, and other compounds as the impurities.

The metal oxide to be used as a catalyst according to the invention is a Group VB or Group VIIB metal oxide, and in particular, metal oxide selected from the group consisting of vanadium, niobium, tantalum, manganese and rhenium can be used. Specific examples thereof include divanadium trioxide, divanadium tetraoxide, divanadium pentoxide, niobium monoxide, diniobium trioxide, niobium dioxide, diniobium pentoxide, tantalum monoxide, tantalum dioxide, ditantalum pentoxide, manganese monoxide, trimanganese tetraoxide, dimanganese trioxide, manganese dioxide, dimanganese heptoxide, dirhenium monoxide, rhenium monoxide, dirhenium trioxide, rhenium dioxide, rhenium pentoxide, rhenium trioxide, dirhenium heptoxide, and the like, among them, manganese oxide such as manganese dioxide and trimanganese tetraoxide, and the like, vanadium oxide such as divanadium pentoxide, and the like, are preferably

used. Further, an oxide of a composite compound obtained by mixing at least two kinds of the above metals can be used.

According to the invention, metal oxide can be used in a powdery form itself, but it can be used as supported on an alumina, silica or silica/alumina support having a honeycomb shape, a granule shape, or the like, or metal oxide itself can be used as molded to these shapes.

In the invention, preferably, the aliphatic carbonyl compounds and/or the aromatic carbonyl compounds in the acid decomposition product are converted to high-boiling compounds under mild reaction conditions, by adding an aqueous sodium hydroxide solution or an aqueous sodium phenoxide solution to an acid decomposition product of the above described alkylaryl hydroperoxide under the condition of an oxygen-containing gas atmosphere, and bringing the acid decomposition product into contact with the above described metal oxide catalyst. The reaction temperature here is suitably 50 to 150°C, and preferably the contact with the metal oxide catalyst is performed at atmospheric pressure or elevated pressure, in the coexistence of an oxygen-containing gas, while heated to 70 to 130°C. The contact time is suitably 5 to 60 minutes, and preferably 10 to 30 minutes. In general, at high temperatures and high pressures, the contact is preferably performed for a short time, while at low temperatures and low pressures, the

contact is preferably performed for a long time.

The contact method is not limited, and the contact can be performed in any method such as a batch process, a continuous process, or the like. Further, the catalyst
5 packed bed may be either a fluidized bed or a fixed bed. The flow rate when the acid decomposition product, of which pH has been adjusted by adding an aqueous alkaline solution, is passed through the catalyst packed bed is suitably LHSV 1 to 12 hr^{-1} , and preferably LHSV 2 to 6 hr^{-1} .

10 The aliphatic carbonyl compounds such as hydroxyacetone (HA), the aromatic carbonyl compounds such as α -phenylpropionaldehyde (α -PPA), and other carbonyl compounds in the acid decomposition product, are converted to the compounds such as a multimer or an oxidation product, which
15 have boiling points higher than those of the carbonyl compounds, by bringing them into contact with a catalyst under the above reaction conditions. Here, the useful components such as phenol and α -methylstyrene are almost not lost. The reason for this is that metal oxide used as a
20 catalyst exhibits a characteristic activity in conversion of the aliphatic carbonyl compounds and the aromatic carbonyl compounds, and further by adjusting pH at the time of reaction using an aqueous sodium hydroxide solution or an aqueous sodium phenoxide solution, such the reaction is
25 highly promoted and high conversion can be obtained under

mild reaction conditions.

Further, according to the invention, the aliphatic carbonyl compounds in the crude phenol can be converted to high-boiling compounds by bringing crude phenol obtained from the above described acid decomposition product of cumene hydroperoxide into contact with the above described metal oxide catalyst. The crude phenol is brought into contact with the metal oxide catalyst at atmospheric pressure or elevated pressure, while heated to 40°C or higher, and preferably 100 to 250°C. The contact time is not limited, but it is suitably 30 to 180 minutes, and preferably 30 to 120 minutes. In general, at high temperatures and high pressures, the contact is preferably performed for a short time, while at low temperatures and low pressures, the contact is preferably performed for a long time.

Here, the contact method is not limited, and the contact can be performed in any method such as a batch process, a continuous process, or the like. Further, the catalyst packed bed may be either a fluidized bed or a fixed bed. The flow rate when the crude phenol is passed through the catalyst packed bed is suitably LHSV 6 to 0.3 hr⁻¹, and preferably LHSV 2 to 0.5 hr⁻¹.

By the contact with the metal oxide catalyst as above, the aliphatic carbonyl compounds such as hydroxyacetone (HA)

and other impurities in the crude phenol are converted to the compounds such as a multimer, which has a boiling point higher than the carbonyl compounds, for example, 3,3,5-trimethyl cyclohexanone, 4-isopentyl cyclohexanone, etc.

5 Here, the useful components such as phenol and α -methylstyrene are almost not lost. The reason for this is supposedly that metal oxide used as a catalyst exhibits a characteristic activity in conversion of the aliphatic carbonyl compounds, and does not have acid strength for an
10 acid catalyst.

Since the carbonyl impurities in the acid decomposition product or crude phenol are converted to the above-mentioned high-boiling compounds by the contact with the metal oxide catalyst as above, they can be easily separated from phenols
15 by distillation in the next stage, to obtain high purity phenol. The methods for separation by distillation include steam distillation, extractive distillation with organic solvent, and the like.

20

EXAMPLES

Hereinbelow, the process of the present invention will be explained specifically with reference to Examples. In Examples, various carbonyl compounds as the impurities, and
25 main components are quantified by gas chromatography to

determine the concentration of each of the impurities before and after treatment.

[Comparative Example 1]

A crude acid decomposition product, which had been
5 adjusted to pH 7 by adding an aqueous sodium hydroxide
solution to an acid decomposition product of cumene
hydroperoxide, was used as a raw material. The composition
of the crude acid decomposition product was as follows:
acetone was 42.0%, cumene was 10.9%, α -methylstyrene was
10 2.0%, phenol was 37.5%, water was 5.0%, hydroxyacetone (HA)
was 1000 ppm, α -phenylpropionaldehyde (α -PPA) was 1200 ppm,
and others was 2.4%.

60.0 g of this crude acid decomposition product was
charged into a 100-ml autoclave made of stainless steel, the
15 inside of the autoclave was pressurized to 0.5 MPa with air
and then slowly heated under stirring, and the reaction was
performed at a temperature of 100°C for 30 minutes. The
obtained product was analyzed, and as a result, HA was 970
ppm and α -PPA was 1100 ppm.

20 [Comparative Example 2]

58.2 g of the above-described crude acid decomposition
product and 1.8 g of an aqueous sodium phenoxide solution
(concentration: 30.2%) were mixed, and the mixture was
charged into a 100-ml autoclave made of stainless steel.
25 Here, pH of the mixed solution was about 10.3. Then, the

inside of the autoclave was pressurized to 0.5 MPa with air and then slowly heated under stirring, and the reaction was performed at a temperature of 80°C for 30 minutes. The obtained product was analyzed, and as a result, HA was 750

5 ppm and α -PPA was 800 ppm.

[Example 1]

A mixed solution (pH 10.3) of 55.2 g of the above-described crude acid decomposition product and 1.2 g of an aqueous sodium phenoxide solution, and 3.0 g of manganese
10 dioxide were charged into a 100-ml autoclave made of stainless steel. Then, the inside of the autoclave was pressurized to 0.5 MPa with air and then slowly heated under stirring, and the reaction was performed at a temperature of 80°C for 30 minutes. The obtained product was analyzed, and
15 as a result, HA was 10 ppm and α -PPA was 80 ppm. Further, production of an α -methylstyrene dimer and cumylphenol was not confirmed. As such, it was proved that the amounts of the carbonyl compounds as the impurities can be remarkably reduced without causing the loss of the useful components by
20 the addition of manganese dioxide.

[Example 2]

The reaction was carried out in the same manner as in Example 1, except that vanadium pentoxide was used instead of manganese dioxide in Example 1. The obtained product was
25 analyzed, and as a result, HA was 9 ppm and α -PPA was 70 ppm.

Further, production of an α -methylstyrene dimer and cumylphenol was not confirmed. As such, for vanadium pentoxide, almost the same result as for manganese dioxide was obtained.

5 [Example 3]

A mixed solution (pH 10.8) of 51.0 g of the above-described crude acid decomposition product and 6.0 g of an aqueous sodium phenoxide solution, and 3.0 g of manganese dioxide were charged into a 100-ml autoclave made of
10 stainless steel under air atmosphere. Then, the autoclave was tightly closed, and then slowly heated under stirring, and the reaction was performed at a temperature of 110°C for 30 minutes. The obtained product was analyzed, and as a result, HA was 5 ppm or less and α -PPA was 50 ppm. Further,
15 production of an α -methylstyrene dimer and cumylphenol was not confirmed.

[Example 4]

The reaction mixture obtained in Example 3 was left standing to separate the reaction solution and manganese
20 dioxide. Then, a newly prepared mixed solution of 51.0 g of a crude acid decomposition product and 6.0 g of an aqueous sodium phenoxide solution, and manganese dioxide without the reaction solution as obtained above were charged into a 100-ml autoclave made of stainless steel under air atmosphere.
25 The autoclave was tightly closed, and then slowly heated

under stirring, and the reaction was performed at a temperature of 110°C for 30 minutes. The obtained product was analyzed, and as a result, HA was 5 ppm or less and α -PPA was 56 ppm. Further, production of an α -methylstyrene dimer and cumylphenol was not confirmed. As such, even when manganese dioxide was repeatedly used twice, the performance of the manganese dioxide catalyst was not lowered.

[Example 5]

The reaction procedure of Example 4 was repeated eight times. The obtained product was analyzed, and as a result, HA was 5 ppm or less and α -PPA was 54 ppm. Further, production of an α -methylstyrene dimer and cumylphenol was not confirmed. As such, even when manganese dioxide was repeatedly used eight times, the performance of the manganese dioxide catalyst was not lowered.

[Example 6]

Crude phenol was obtained by neutralizing an acid decomposition product of cumene hydroperoxide, and removing most of the low-boiling substances such as acetone, water, cumene and α -methylstyrene, and most of the high-boiling substances such as acetophenone and α -dimethyl carbinol by distillation. It was found that the obtained crude phenol contained 0.3% by weight of HA, 1 to 2% by weight of α -methylstyrene, and 0.2% by weight of other carbonyl compounds as the total carbonyl compounds (in terms of

mesityl oxide).

50 g of this crude phenol was charged into a 100-ml autoclave made of stainless steel and 1 g of powdered manganese dioxide was further added thereto, and the autoclave was purged with nitrogen, and then slowly heated under stirring, and the reaction was performed at a temperature of 170°C for 2 hours. The obtained product was analyzed, and as a result, HA was 5 ppm or less and the total carbonyl compounds was 30 ppm or less. Further, the amount of the produced 2-methylbenzofuran was only 0.5 mol% based on HA, and production of an α -methylstyrene dimer and cumylphenol was not confirmed.

[Example 7]

The reaction was carried out in the same manner as in Example 6, except that trimanganese tetraoxide was used instead of manganese dioxide in Example 6. As a result, HA was 5 ppm or less and the total carbonyl compounds was 30 ppm or less. Further, the amount of the produced 2-methylbenzofuran was 0.5 mol% based on HA, and production of an α -methylstyrene dimer and cumylphenol was not confirmed.

[Example 8]

The reaction was carried out in the same manner as in Example 6, except that divanadium pentoxide was used instead of manganese dioxide in Example 6. As a result, HA was 5 ppm or less and the total carbonyl compounds was 30 ppm or

less. Further, the amount of the produced 2-methylbenzofuran was 1.5 mol% based on HA, and production of an α -methylstyrene dimer and cumylphenol was not confirmed.

[Comparative Example 3]

5 The reaction was carried out in the same manner as in Example 6, except that hydrogen exchanged mordenite type zeolite satisfying an acidity function of $H_0 \leq -8.2$ was used instead of manganese dioxide in Example 6. As a result, the amount of the produced 2-methylbenzofuran was 70 mol% based
10 on HA, and α -methylstyrene was totally condensed or polymerized.

[Comparative Example 4]

 The reaction was carried out in the same manner as in Example 6, except that γ -alumina having an acidity function
15 adjusted to $+4.0 \leq H_0 < 6$ was used instead of manganese dioxide in Example 6. As a result, HA in the reaction solution was 2000 ppm, and it was proved that the reaction did not proceed sufficiently.

[Comparative Example 5]

20 The reaction was carried out in the same manner as in Example 6, except that a cation exchange resin (Amberlyst-15R) was used instead of manganese dioxide in Example 6, and the reaction temperature was set at 120°C. As a result, the amount of the produced 2-methylbenzofuran was 90 mol% based
25 on HA, and α -methylstyrene was totally condensed or

SF-1373PCT

21

polymerized.

CLAIMS

1. A process for purifying phenols, which comprises bringing an acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide into contact with a Group VB or Group VIIB metal oxide to convert the aliphatic carbonyl compounds and/or the aromatic carbonyl compounds in the acid decomposition product of alkylaryl hydroperoxide to higher-boiling compounds, and then separating the high-boiling compounds and phenols by distillation.
2. The process for purifying phenols according to claim 1, which comprises adding an aqueous alkaline solution to an acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide, and bringing the acid decomposition product into contact with at least one metal oxide selected from Group VB and Group VIIB metal oxides in the coexistence of an oxygen-containing gas to convert the aliphatic carbonyl compounds and/or the aromatic carbonyl compounds in the acid decomposition product of alkylaryl hydroperoxide to higher-boiling compounds, subsequently neutralizing the reaction solution, and then separating the high-boiling compounds and phenols by distillation.
3. The process for purifying phenols according to claim 1

or 2, wherein the alkylaryl hydroperoxide is at least one selected from cumene hydroperoxide, ethylbenzene hydroperoxide, secondary butylbenzene hydroperoxide, cymene hydroperoxide and diisopropylbenzene hydroperoxide.

5

4. The process for purifying phenols according to any one of claims 1 to 3, wherein the alkylaryl hydroperoxide is cumene hydroperoxide, and the phenol is phenol.

10

5. The process for purifying phenols according to any one of claims 2 to 4, wherein the aqueous alkaline solution is at least one selected from an aqueous sodium hydroxide solution and an aqueous sodium phenoxide solution.

15

6. The process for purifying phenols according to any one of claims 2 to 5, wherein an effective amount of the aqueous alkaline solution is added such that pH of the acid decomposition product is maintained in the range of about 4 to 12.

20

7. The process for purifying phenols according to any one of claims 1 to 6, which comprises bringing an acid decomposition product obtained by acid decomposition of alkylaryl hydroperoxide into contact with at least one metal oxide selected from Group VB and Group VIIB metal oxides at

25

a temperature of 50 to 150°C.

8. The process for purifying phenols according to claim 1, which comprises bringing crude phenol obtained from an acid decomposition product of cumene hydroperoxide into contact with a Group VB or Group VIIB metal oxide catalyst, to convert the aliphatic carbonyl compounds in crude phenol to higher-boiling compounds, and then separating the high-boiling compounds and phenol by distillation.

9. The process for purifying phenols according to claim 8, wherein the crude phenol and the metal oxide catalyst are brought into contact at a temperature of 100 to 250°C for 30 to 180 minutes.

10. The process for purifying phenols according to any one of claims 1 to 9, wherein the Group VB or Group VIIB metal oxide is metal oxide selected from the group consisting of vanadium, niobium, tantalum, manganese and rhenium.

11. The process for purifying phenols according to any one of claims 1 to 10, wherein the separation of phenols from the reaction products after the contact with metal oxide by distillation is steam distillation or extractive

SF-1373PCT

25

distillation with organic solvent.