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Patent Request: Standard Patent

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We, the Applicant/Nominated Person specified below, request we be granted a patent for the invention disclosed in the accompanying standard complete specification.

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[54] Invention Title:

Heat Transfer of Bauxite

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Basic Convention Application Details

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Registered Patent Attorney



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NOTICE OF ENTITLEMENT

I, Albertus Wilhelmus Joannes ZEESTRATEN, of Carel van Bylandtlaan 30, 2596 HR The Hague, the Netherlands, being authorised by the Applicant/Nominated Person in respect of Application No. 19544/92 state the following:-

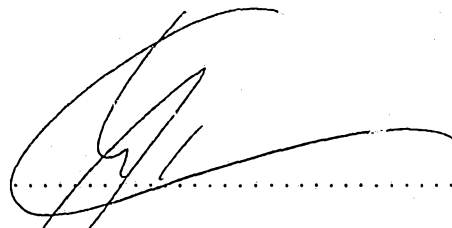
The Applicant/Nominated Person has entitlement from the actual inventor(s) as follows:-

The Applicant/Nominated Person is the assignee of the actual inventor(s).

The Applicant/Nominated Person is the applicant of the basic application(s) listed on the Patent Request.

The basic application(s) listed on the Patent Request is/are the application(s) first made in a Convention Country in respect of the invention.

DATED this 11th day of June, 1992


.....
Albertus Wilhelmus Joannes ZEESTRATEN



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(54) Title
HEAT TREATMENT OF BAUXITE

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(56) Prior Art Documents
GB 1383136
EP 375987

(57) Claim

1. A heat treatment process for the removal of organic matter from bauxite ore containing alumina hydrate mainly in the form of gibbsite, comprising the steps of:

- preparing the bauxite ore to particles having a grain size of at most 8 mm;
- heating said particles in a roasting zone of a roasting apparatus to a temperature in a high temperature range from 400 to 600 °C while a roasting gas is contacting substantially all said particles and has a water vapour pressure not exceeding 2 kPa; and
- holding said particles for a period of time in said roasting zone in said temperature range in contact with said roasting gas, thereby reducing the amount of water bound to said alumina hydrate to less than 0.5 mole per mole alumina.

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

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Invention Title: Heat Treatment of Bauxite

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

HEAT TREATMENT OF BAUXITE

The present invention relates to a heat treatment process for the removal of organic matter from bauxite ore containing alumina hydrate mainly in the form of gibbsite.

5 In particular the present invention relates to a heat treatment process for the removal of organic matter from bauxite ore prior to processing said bauxite in a process for digesting said bauxite with an aqueous alkali solution from which aluminium hydroxide is precipitated, the so-called Bayer process.

10 The most common method for the production of aluminium hydroxide from alumina-containing ores, hereafter referred to as bauxite, is the Bayer process. The aluminium hydroxide produced is usually converted into alumina intended for the electrolytical production of aluminium.

15 In the Bayer process bauxite is digested with an aqueous alkali solution, generally being an aqueous solution of sodium hydroxide (often referred to as caustic solution), at elevated temperature. Spent liquor, obtained after precipitating aluminium hydroxide from the digestion solution in a later stage in the Bayer process, is used as aqueous alkali solution. After the digestion
20 step the obtained slurry, comprising a solution of alkali aluminate in which solution the constituents of the bauxite which are insoluble in the alkali solution are suspended, is cooled. Commonly flash cooling is used. After separation and washing of the solid phase, generally referred to as red mud, the supersaturated sodium aluminate solution is further cooled and seeded with aluminium
25 hydroxide particles to cause precipitation of aluminium hydroxide. The precipitated aluminium hydroxide is separated, washed, dried and calcined at high temperatures to form alumina. The sodium aluminate liquor with its reduced alumina content (spent liquor) is
30 recycled to the bauxite digestion step after concentrating, if necessary, to remove water which has been introduced into the

system, for example during washing the red mud and/or the precipitated aluminium hydroxide, and recharged with sodium hydroxide to make-up for sodium hydroxide losses from the circuit.

5 The alumina in bauxite generally exists in the form of alumina trihydrate ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ or $\text{Al}(\text{OH})_3$, gibbsite) and/or alumina monohydrate ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ or $\text{AlO}(\text{OH})$, boehmite). Alumina trihydrate dissolves much more easily in aqueous alkali solutions than monohydrate. Thus, alumina trihydrate containing bauxites can be digested at lower temperatures and pressures than monohydrate
10 containing bauxites.

In addition to alumina hydrates bauxite ores contain many other components. The most important ones are silica as quartz and within clay minerals, most commonly kaolinite, iron oxides, usually as goethite and/or haematite, metal sulfides, and organic matter,
15 such as cellulose and humus.

Dependent on the specific ore, the composition of which has been determined by local geological conditions and the geological history of the site concerned, the amount of organic matter can be up to several per cent by weight. A substantial portion of the
20 organic matter, usually more than 50% by weight, dissolves in the sodium aluminate liquor during digestion.

It is well known that the presence of organics has several disadvantageous effects in the Bayer process, especially in the clarification and precipitation steps.

25 It is common experience that the presence of said organic matter in the Bayer liquor reduces the efficiency by which the aluminium hydroxide can be precipitated: the rate of precipitation is smaller and it is more difficult to control product morphology and soda content.

30 Moreover the long chain organics give more viscous liquors which reduces also other operating efficiencies in the alumina production plant, for example pumping and settling efficiencies.

The adverse effect on red mud settling may be aggravated by organic poisons that interfere with red mud flocculation.

Furthermore, caustic soda is consumed during dissolution and oxidative breakdown of organics in the Bayer stream.

An organic impurity commonly found in Bayer liquor is sodium oxalate, a compound known for its stability, also at digestion temperatures, and for its limited solubility in caustic soda solutions. Sodium oxalate precipitation from liquor contaminated with organics is an established cause for a range of inefficiencies in the aluminium hydroxide precipitation area, such as poor agglomeration, excessive nucleation, inadequate aluminium hydroxide classification and formation of scales on internal surfaces of equipment. Oxalate removal requirements add to the operating cost of a Bayer circuit and there are environmental aspects associated to oxalate removal. The intake of organic matter by the Bayer circuit also leads to higher operating cost related to carbonate removal.

An integral solution to the aforementioned problems is to substantially reduce the introduction of organics into the Bayer liquor stream by removal of the organics from the main source, the bauxite feed. A known method is to calcine the ore prior to submit it to the digestion step of the Bayer process.

For example from the British patent 1,383,136 it is known to calcine gibbsitic bauxite which contains iron in the form of an oxide of the goethite type in an amount of 10 to 25% (weight Fe_2O_3) in a temperature range from 250 to 600 °C. Thereby the amount of water of crystallization bound to the alumina (Al_2O_3) is reduced to less than 3 moles, but more than 0.5 mole per mole alumina.

In more detail the bauxite types mentioned contain 0.2% by weight or more of organic carbon. Especially for the Renell bauxite measures were taken in order to cope with its very fine particle size of about 10 μm . Thus steps were necessary in order to prepare the bauxite to be calcined in the form of pellets, containing 10 to 25% by weight of water and having a particle size distribution ranging from 0.5 to 5 mm. The calcining step is carried out at a temperature in the range of 250 to 600 °C and for a retention time of 15 to 120 minutes in a fluidized bed under supply of heated air

having a superficial velocity between 1 and 3.8 m/s. The final mole ratio of alumina bound water to alumina should be more than 0.5.

In addition, the presence of 10-25% Fe_2O_3 as goethite in the bauxite is considered having a favourable influence so as to
5 prevent the transition of gibbsite to boehmite. The extractability of the alumina could thus be maintained at roughly the same level as it was before the calcining step.

Although the above detailed teachings imply an efficient way of attacking the organics in the raw ore material, it appears that
10 the specified roasting conditions are not sufficient and, as far as the water to alumina mole ratio is concerned, not fully correct, for a guarantee that calcining bauxite in the prescribed manner will not lead to losing alumina extractability. However, a possible influence of the water partial pressure in the heated air
15 surrounding the bauxite particles during the heat treatment process is suggested nowhere.

In the European patent application published under No. 375987 calcining of gibbsitic bauxite, crushed to particles having sizes less than 63 μm , the temperature range from 300 to 400 °C during
20 corresponding time periods of 120 to 10 min is shown, thereby both reducing the amount of organic matter (shown up to 70% by weight), and converting gibbsite to a form of aluminium oxide better soluble in Bayer digest liquor than the original gibbsite. With an ore ground to such sizes the gibbsite dehydration process is generally
25 more favoured to proceeding towards highly soluble alumina forms than is the case with an ore of larger sizes.

The significance of said document is that it provides a method for efficient and selective reduction of oxalate input into the Bayer liquor stream during bauxite digestion. However, only up to
30 about 70% of the organic carbon is removed leaving still up to at least 0.10% by weight organic carbon in the treated bauxite.

Furthermore, no general conclusions on solubility effects can be drawn from the examples shown in said document because of the fact that for that feature the bauxite which was investigated had a
35 grain size of only 63 μm . Generally this is considered as being far

from representative as to bauxites to be processed in a Bayer process.

Thus, it is an object of the invention to improve and in particular to expand the above-mentioned bauxite calcining processes in such a way that the risk of losing alumina extraction efficiency, present with the aforementioned procedures, is minimized while more than 90% of the organic carbon is removed.

It is a further object of the invention to prepare bauxite ores to be processed in a Bayer process in such a way that the operation of the Bayer process improves.

It is another object of the invention that the alumina extractability resulting from processing roasted bauxite ores in a Bayer process is at least equal to conventional extractability.

The invention therefore comprises a heat treatment process for the removal of organic matter from bauxite ore as indicated above, comprising the steps of: preparing the bauxite ore to particles having a grain size of at most 8 mm; heating said particles in a roasting zone of a roasting apparatus to a temperature in a high temperature range from 400 to 600 °C while a roasting gas is contacting substantially all said particles and has a water vapour pressure not exceeding 2 kPa, and holding said particles for a period of time in said roasting zone in said temperature range in contact with said roasting gas, thereby reducing the amount of water bound to said alumina hydrate to less than 0.5 mole per mole alumina. Preferably said alumina hydrate is converted to alumina which is well extractable when processed in a process for digesting bauxite ore with an aqueous alkali solution from which aluminium hydroxide is precipitated.

In a preferred embodiment the above heat treatment process further comprises, prior to the step of heating said particles in said roasting zone, the steps of, heating said particles in a preroasting zone of a roasting apparatus to a temperature in a low temperature range from 250 to 380 °C by means of a heating gas, and holding said particles in said preroasting zone in contact with

said heating gas in order to decompose the gibbsite present in the ore.

Such processes permit thermally treating gibbsitic bauxite ores, thereby obtaining well extractable alumina, mostly in the
5 form of amorphous alumina, containing a.o. microcrystalline chi-alumina.

Thus, most different compositions, i.e. as to their alumina, alumina-type, iron oxide, silica and organic matter content, can be processed advantageously, resulting in advantageous Bayer process
10 extractabilities, at least equal to those obtainable without said heat treatment.

The invention will now be described in more detail.

From the above discussions it can be concluded that the conditions to be applied for the substantial removal of organic
15 material from bauxite by heating are not necessarily determined by organics combustion requirements alone. It is equally important, with respect to bauxite processing efficiency in the Bayer process, that in the heat treatment process, conditions are avoided that promote the conversion of gibbsite into alumina-bearing compounds
20 of a lesser extractability in Bayer digestion than gibbsite, such as (pseudo)-boehmite and gamma-alumina. It appears that massive dissociation of gibbsite is inevitable at temperatures required for combustion of a substantial part of the organics present in bauxite, that is at 400 °C or higher. Now, if gibbsite dissociation
25 cannot be avoided, the dissociation process should be controlled to producing well extractable alumina compounds, such as chi-alumina.

It is known that chi-alumina, like pseudo-boehmite, can be directly formed from gibbsite, while the less extractable gamma-alumina is formed from boehmite or pseudo-boehmite.

Therefore, it would be advantageous, if the formation of
30 pseudo-boehmite during the heat treatment process is avoided. Unfortunately, this appears only possible under conditions that are otherwise less expedient, such as using a very fine bauxite particle size. Thus, under practical and expedient conditions a
35 certain amount of gibbsite will dissociate to pseudo-boehmite.

Surprisingly, experimental results showed that subsequent dissociation of the pseudo-boehmite not necessarily produces the sparingly extractable gamma-alumina. Said dissociation reaction proceeds towards a well extractable form of alumina, when the water partial pressure in the roasting gas surrounding the bauxite particles is kept small, preferably below 2 kPa, more preferably below 1 kPa. Since pseudo-boehmite is unstable, thus dissociates, at temperatures above 380 °C, conditions must be applied in order to minimize the water partial pressure in the roasting gas surrounding any of those bauxite particles that are at a temperature above 380 °C in the heat treatment process.

These conditions include:

- substantially complete gibbsite dissociation so that there is not more than a minimum, preferably no contribution to the water partial pressure from water released by this reaction;
- to prevent that the water vapour, that is being released from dissociating pseudo-boehmite, accumulates in the boundary gas layer around the bauxite particle concerned i.e. that the reaction proceeds preferably slowly and that the released water vapour is preferably quickly transported from the boundary layer to the roasting gas and, furthermore, is sufficiently diluted by the roasting gas; and
- to accomplish that any gas flow leading to that part of the roasting apparatus where the bauxite temperature exceeds 380 °C, contains virtually no water vapour, thus, does not originate from low temperature conditions part and also contains less than 1% (v/v) water vapour from other sources e.g. from fossil fuel combustion.

Thus, the gibbsite is decomposed in a low temperature stage carried out at a temperature in a low temperature range not exceeding 380 °C, preferably between 300 and 350 °C, which stage precedes a high temperature stage carried out at a temperature in a high temperature range. In particular, this high temperature stage is carried out at a temperature between 400 and 600 °C, preferably between 420 and 580 °C, more preferably between 450 and 520 °C, and

serves the dual purpose of completing the organics combustion and of converting all pseudo-boehmite that may have been formed to a well extractable form of alumina.

5 The process in accordance with the invention, especially with respect to said high temperature stage, advantageously said particles in said roasting zone are gradually heated to said temperature according to an average temperature gradient not exceeding 15 °C/min. However, as will be clear to those skilled in the art, such a temperature gradient is strongly dependent on the
10 type of reactor used.

Furthermore said roasting gas advantageously contains more than 0.1% by volume oxygen, both for heating in the high temperature range and for preroasting in the low temperature range. Suitably said gas is a stream of air having a low water vapour
15 content. However, further oxygen-rich gas streams may be used.

Any gas flow from the high temperature stage may be used in the low temperature stage for gibbsite decomposition, e.g. a counter-current flow concept can be applied. However, the gas from the low temperature stage, or from a possible preceding bauxite
20 drying step, may not be employed in the high temperature stage. The gas flow for the high temperature stage operated in the roasting apparatus is preferably indirectly heated, or otherwise directly heated by combustion of carbonaceous fuel of low hydrogen content. All bauxite particles are preferably in contact with the gas flow
25 and a superficial gas flow velocity through the roasting apparatus is chosen in a flow velocity range from 0.1 m/s. Although said range seems rather wide it will be clear to those skilled in the art that the flow velocity chosen will depend highly on the type of roasting apparatus employed. So there will be great differences in
30 operating conditions between a fluidized bed reactor or a rotary kiln. Although highly dependent on the roasting apparatus used, said apparatus may enclose both the roasting zone and the preroasting zone.

The holding time of bauxite particles in the high temperature
35 stage must be sufficiently long so that all pseudo-boehmite that

may have been formed in the preceding steps is fully dissociated and the amount of water of crystallization bound to the extractable alumina has become less than 0.5 mole per mole Al_2O_3 . Thus, it has appeared that holding times in the range from at least 3 to at most 60 min are preferred. For example a roasting time of 15 minutes at 500 °C was found to be adequate for particles of 3 mm diameter in the case of Western Australian Darling Range bauxite from the Mount Saddleback area.

The extractability of alumina from bauxite appears also affected by sintering which reduces the internal surface area and therewith the reactivity of the alumina. It was established that the internal surface area of the bauxite is primarily a function of temperature. The internal surface area reaches a maximum at approximately 400 °C and then gradually reduces with increasing temperature. It becomes difficult to maintain alumina extractability when the bauxite is heated to temperatures above 600 °C. Moreover, chemical conversion to other alumina types, of reduced extractability, occurs when the bauxite temperature well exceeds 700 °C.

Generally the heat treatment conditions are related to the ore supplied. In particular, it is advantageous to have only bauxite ore material having a grain size distribution with an upper particle size of 8 mm. Generally, with decreasing particle size the required roasting time decreases and, furthermore, the particle size bandwidth of said distribution becomes more narrow, which in industrial practice provides a better condition for achieving desired adequate contact of the gas flow with all particles. Since the heat treatment process of the invention is advantageously a pretreatment step in the context of processing bauxite according to the Bayer process, also economics of grinding during preparation of said bauxite have to be taken into account. Thus, dependent on further Bayer process characteristics advantageously the preferred optimum particle grain size will lie well below 8 mm maximum, for example about 3 mm.

In a further embodiment of the process in accordance with the invention a drying step prior to the preroasting and/or the heating step in a drying temperature range from 100 to 250 °C, advantageously from 100 to 150 °C, to be carried out in a drying zone in a drying apparatus, is comprised. Thereby, substantially all free water as present in the bauxite ore is vapourized.

Although said drying step is likely carried out at the mine site, in a further embodiment in accordance with the present invention said drying zone is enclosed in the above-mentioned roasting apparatus.

To further elucidate the process in accordance with the invention an example representing the behaviour of some parameters mentioned above in relation to water partial pressure p_{H_2O} is presented. In said example the bauxite is digested under standard conditions after having been processed according to the invention. Digestion efficiencies for untreated ore material are compared. Thus, extractabilities, respectively E_t and E_n , are shown. Furthermore, temperatures at start and finish of the addition of air having a predetermined water vapour pressure, respectively T_s and T_f , the ratio of water bound to alumina and of said alumina, being n_r , the loss of ignition-value (L), recalculated to the original untreated bauxite, and reduction of total organic content (TOC red.) are given in the table below.

In this example the type of bauxite investigated originated from Darling Range, Mount Saddleback, Australia. The bauxite ore particles had grain sizes between 1.6 and 3.15 mm. The step of roasting was carried out in a fixed bed, whereas air under standard pressure and temperature (STP) conditions was supplied at a superficial flow velocity of 4 m/min, and the temperature gradient used was 8 °C/min.

P_{H_2O} (kPa)	T_s (°C)	T_f (°C)	n_r (mole/mole)	L (% w)	E_n (% w)	E_t (% w)	TOC red. (% w)
nil	-	-	0.46	18.6	97	99	97
5	110	350	0.33	19.2	97	98	97
5	350	515	0.26	19.6	97	95	97
5	110	515	0.27	19.6	97	95	97

From the above table the following can be concluded. If the air is substantially dry during the whole process the extractability after heat treatment E_t is improved clearly. The E_t improvement is only slightly reduced if water is injected during a first heating trajectory up to 350 °C, but significantly reduced if water is injected in a second heating trajectory or during the whole heating step. It can be seen that from 350 °C the effect of water injection is dominant as to the whole. Thus, in particular above 350 °C the presence of water should be avoided.

It is noted further that the size grain distribution is rather narrow and only relates to relatively small particles; moreover a slow heating rate was chosen. Consequently a low superficial air flow velocity was employed in order to investigate more appropriate the influence of water partial pressure in the heat treatment process.

Summarizing the above, it can be concluded that a detailed attack of the problem of organic matter in the bauxite ore includes tuning and setting a set of parameters. It is noted further that the starting conditions as to water content, both in the gas flow and in the ore, will have significant consequences, in first instance as to the bauxite ore to be processed in the Bayer process, and in second instance as to extractability of the alumina.

Besides the above it is noted that the roasting process stages in accordance with the present invention have appeared a further

advantage as to the metal sulfides, originally contained within the bauxite ore. By said roasting sulphur from said sulfides is converted at least partly to sulphurdioxide and will therefore not be subjected to the digestion process. Consequently increased
5 aluminate concentrations are obtained and less sulphates are extracted, thus resulting in increased liquor productivity values. As yet a further advantage of the roasting process the Bayer liquor stability increases which means that the tendency for autoprecipitation of aluminahydrate decreases.

10 In view of the above, an advantageous economic outlook for processing bauxite ores of most different compositions is obtained.

In this context it is emphasized that in the whole set up and economics of the Bayer process it can be advantageous that only a part of the bauxite ore is treated in accordance with the process
15 of the present invention.

Various modifications of the present invention will become apparent to those skilled in the art from the foregoing description and accompanying example. Such modifications are intended to fall within the scope of the appended claims.

C L A I M S

The claims defining the invention are as follows:

1. A heat treatment process for the removal of organic matter from bauxite ore containing alumina hydrate mainly in the form of gibbsite, comprising the steps of:
 - 5 - preparing the bauxite ore to particles having a grain size of at most 8 mm;
 - heating said particles in a roasting zone of a roasting apparatus to a temperature in a high temperature range from 400 to 600 °C while a roasting gas is contacting substantially all said particles and has a water vapour pressure not
10 exceeding 2 kPa; and
 - holding said particles for a period of time in said roasting zone in said temperature range in contact with said roasting gas, thereby reducing the amount of water bound to said alumina hydrate to less than 0.5 mole per mole alumina.
- 15 2. The process as claimed in claim 1, wherein said water vapour pressure in said gas does not exceed 1 kPa.
3. The process as claimed in claim 1, wherein said high temperature range is from 420 to 580 °C.
4. The process as claimed in claim 1, wherein said high
20 temperature range is from 450 to 520 °C.
5. The process as claimed in any one of the foregoing claims, wherein said roasting gas has a superficial velocity of at least 0.1 m/s.
6. The process as claimed in any one of the foregoing claims,
25 wherein said roasting gas contains more than 0.1% by volume oxygen.
7. The process as claimed in any one of the foregoing claims, wherein said particles in said roasting zone are gradually heated to said temperature according to an average temperature gradient not exceeding 15 °C/min.

8. The process as claimed in any one of the foregoing claims, wherein said period of time in said high temperature range is from at least 3 min to at most 60 min.

9. The process as claimed in any one of the foregoing claims, wherein, prior to the step of heating said particles in said
5 roasting zone, the process further comprises the steps of:

- heating said particles in a preroasting zone of a roasting apparatus to a temperature in a low temperature range from 250 to 380 °C, by means of a heating gas; and
- 10 - holding said particles in said preroasting zone in contact with said heating gas in order to decompose the gibbsite present in the ore.

10. The process as claimed in claim 9, wherein said particles are heated in said preroasting zone to a temperature in said low
15 temperature range from 300 to 350 °C.

11. The process as claimed in claim 9 or 10, wherein said heating gas contains more than 0.1% by volume oxygen.

12. The process as claimed in any one of the claims 9 to 11, wherein said heating gas has a superficial velocity of at least
20 0.1 m/s.

13. The process as claimed in claims 1 and 9, wherein said preroasting zone is enclosed in said roasting apparatus.

14. The process as claimed in any one of the foregoing claims, further comprising, prior to said heating and/or roasting step, a
25 drying step carried out in a drying zone in a drying apparatus in a drying temperature range from 100 to 250 °C in order to vaporize free water present in the ore.

15. The process as claimed in claim 14, wherein said drying temperature range is from 100 to 150 °C.

30 16. The process as claimed in claim 1 and/or 9, wherein said drying zone is enclosed in said roasting apparatus.

17. The process as claimed in any one of the foregoing claims, whereby the removal of organic carbon amounts to more than 90% by weight.

18. The process as claimed in claim 1, wherein substantially all said alumina hydrate is converted to alumina which is well extractable in a process for digesting bauxite ore with an aqueous alkali solution from which aluminium hydroxide is precipitated.

5 19. The process as claimed in any one of the foregoing claims, wherein said heat treatment process is carried out prior to a process for digesting bauxite ore with an aqueous alkali solution from which aluminium hydroxide is precipitated.

10 20. Heat treatment process for the removal of organic matter from bauxite ore containing alumina hydrate mainly in the form of gibbsite substantially as described in the description with reference to the example.

DATED this SIXTEENTH day of JUNE 1992

Shell Internationale Research Maatschappij B.V.

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

A B S T R A C T

HEAT TREATMENT OF BAUXITE

A heat treatment process for the removal of organic matter from bauxite ore containing alumina hydrate mainly in the form of gibbsite comprises the steps of preparing the bauxite ore to particles having a size of at most 8 mm, heating said particles in a roasting zone of a roasting apparatus to a temperature of a high temperature range from 400 to 600 °C, while a roasting gas is contacting substantially all said particles and has a water vapour pressure not exceeding 2 kPa, and holding said particles for a period of time in said roasting zone in said temperature range in contact with said roasting gas. Thereby the amount of water bound to said alumina hydrate is reduced to less than 0.5 mole per mole alumina. Substantially all the alumina hydrate is converted to alumina, which is well extractable when processed in a process for digesting bauxite ore with an aqueous alkali solution from which aluminium hydroxide is precipitated.