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(71) Applicant (for all designated States except US): **TECHNOLOGICAL RESOURCES PTY. LIMITED** [AU/AU]; 120 Collins Street, Melbourne, Victoria 3000 (AU).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **PAINTER, Carly, Louise** [AU/AU]; c/- Level 7, 15-17 William Street, Perth, Western Australia 6000 (AU). **BOX, John, Clarence** [AU/AU]; c/- Level 7, 15-17 William Street, Perth, Western Australia 6000 (AU). **REES, Kevin, Lee** [AU/AU]; c/- Rio Tinto Technology and Innovation, 1 Research Avenue, Bundoora, Victoria 3083 (AU). **LON-ERGAN, Adam, Bain** [AU/AU]; c/- Rio Tinto Technology & Innovation, 1 Research Avenue, Bundoora, Victoria 3083 (AU).

(74) Agent: **GRIFFITH HACK**; Level 3, 509 St Kilda Road, Melbourne, Victoria 3004 (AU).

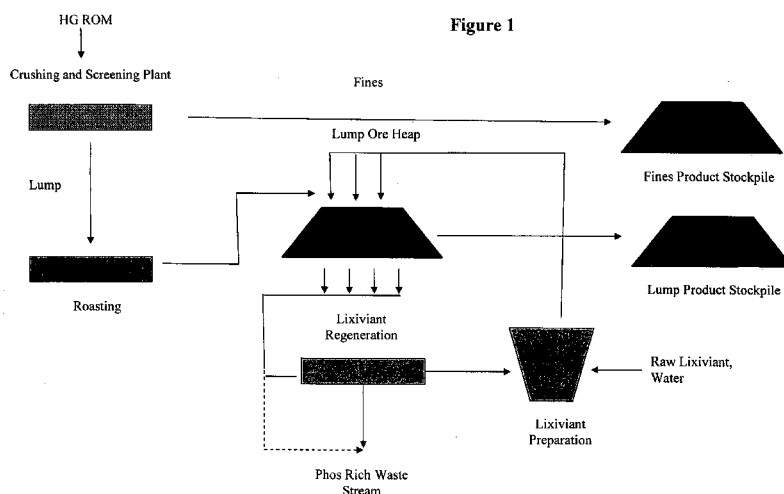
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(54) Title: TREATING IRON ORE



(57) Abstract: A process for lowering the concentration of phosphorus in iron ore is disclosed. The process comprises roasting and then leaching iron ore or upgraded concentrates of iron ore having a concentration of at least 0.05 wt. % phosphorus to lower the phosphorus level in the iron ore and then washing leached iron ore to at least partially remove leach liquor retained on the iron ore. The process allows more extensive exploitation of high phosphorus resources than is currently possible.

- 1 -

TREATING IRON ORE

The present invention relates to a process for removing phosphorus from iron ore and concentrates of iron ore.

The present invention relates particularly, although by no means exclusively, to a process that comprises roasting and then leaching iron ore or upgraded concentrates of iron ore to lower the phosphorus concentration in the iron ore. The process produces an iron ore that has a lower phosphorus concentration. The processed iron ore can be sold as a commercial product. Alternatively, the processed iron ore can be blended with iron ores having different phosphorus concentrations to produce other commercial products.

There are substantial iron ore deposits in the Pilbara region of Western Australia and elsewhere that are high in phosphorus, i.e. having phosphorus concentrations greater than 0.1 wt.%. Phosphorus is an undesirable element in iron ore as it promotes brittleness in steel produced from the iron ore. Typically, steel grades specify phosphorus concentrations less than 0.04 wt.%. Steelmaking processes typically include a step of removing phosphorus from steel if the phosphorus is too high. It is desirable to lower the phosphorus concentration in iron ores to improve the viability of high phosphorus deposits. In addition, it is desirable to lower the phosphorus concentration in iron ores to increase the marketability of current deposits.

The present invention relates particularly, although by no means exclusively, to iron ore resources in which the phosphorus is closely or intimately associated with iron-containing minerals in iron ore.

- 2 -

Research work carried out by the applicant has found that in some iron ore resources the phosphorus present in the ore is associated with iron-containing minerals such as goethite rather than in discrete phosphorus-containing minerals. The term "associated" is understood to mean that there is a close correlation between the presence of phosphorus and iron-containing minerals in the ore. In particular, the research work has found that a large portion of the phosphorus is contained in these iron containing minerals.

The applicant has also found that, due to its association with iron-containing minerals such as goethite rather than in discrete phosphorus-containing minerals, such as apatite, physical separation techniques are not always effective in removing phosphorus from iron ore.

The above description is not to be taken as an admission of the common general knowledge in Australia or elsewhere.

According to the present invention there is provided a process for removing phosphorus from iron ore or a concentrate of iron ore having a concentration of at least 0.05 wt.% phosphorus that comprises:

- (a) roasting a feed material comprising iron ore or upgraded concentrate of iron ore having a phosphorus concentration of at least 0.05 wt.% to improve the accessibility of a leach liquor to phosphorus in the ore;
- (b) leaching phosphorus from the roasted iron ore with a leach liquor; and
- (c) washing leached iron ore to at least partially remove leach liquor retained on the iron ore.

- 3 -

The above-described process removes a contaminant, namely phosphorus, from iron ore and leaves a beneficiated iron ore that has increased value because of a lower phosphorus concentration. The washing step (c) ensures that there is minimal carry-over on the beneficiated iron ore of phosphorus, sodium or other elements that are present within or dissolved in the leach liquor and are regarded as undesirable contaminants in steelmaking processes or ultimate product.

The roasting step (a) may be an atmospheric roast that does not comprise the use of a solid or gaseous reductant.

15

The roasting step (a) may be carried out at a temperature and/or for a time to facilitate removal of a part and not all of the phosphorus in the feed material in the subsequent leaching step (b). This applies particularly in situations in which the processed iron ore is subsequently blended with other iron ores having different compositions to produce a commercial product having a required iron composition and a key issue is to lower the phosphorus concentration sufficiently to allow maximum flexibility to blend different iron ores and produce the commercial product.

The roasting step (a) is desirably carried out at a temperature and/or for a time to facilitate increased removal of at least a part of the phosphorus in the feed material in the subsequent leaching step (b).

The roasting step (a) may be carried out at a temperature and/or for a time to facilitate removal of at least 20% and up to 60%, typically 30 to 50%, by weight of the total weight of phosphorus in the feed material in the subsequent leaching step (b).

- 4 -

The roasting step (a) may be carried out at a temperature and/or for a time to facilitate removal of substantially all, i.e. at least 85 %, by weight of the total weight of phosphorus in the feed material in the subsequent leaching step (b).

The roasting step (a) may be carried out at a temperature in a range of 400-1200°C.

The temperature may be less than 1000°C.

The temperature may be less than 600°C.

The temperature may be less than 500°C.

The temperature may be greater than 350°C.

The temperature may be greater than 370°C.

The roasting step (a) may be carried out for a roast time of less than 3 hours.

The roasting step (a) may be carried out for a roast time of less than 2 hours.

The roasting step (a) may be carried out for a roast time of less than 1 hour.

The iron ore may be any iron ore.

The applicant has found that the present invention is applicable particularly, although not exclusively, to iron ore that contains at least some goethite.

The iron ore may have at least 0.10 wt.% phosphorus.

- 5 -

The feed material for roasting step (a) may be run-of-mine ore and/or iron ore that has been subjected to size reduction.

5 By way of example, the process may comprise separating run-of-mine iron ore into lump and fines iron ore streams and treating one or both streams as the feed material in roasting step (a) and leaching step (b) without additional grinding or milling of the lump or
10 fines streams.

The term "lump" as used herein is understood to mean nominal plus 6.3 mm and minus 31.5 mm, with 100 wt.% of the ore being minus 40 mm and less than 10 wt.% of the ore
15 being minus 6.3 mm.

The term "fines" as used herein is understood to mean nominal minus 6.3 mm.

20 The process may comprise regenerating the leach liquor from the leaching step (b) and re-using the leach liquor, for example in the leaching step.

The regeneration step may comprise removing
25 phosphorus from the leach liquor.

The leach liquor for the leaching step (b) may be caustic soda.

30 The leach liquor for the leaching step (b) may be an acid.

The selection of a suitable leach liquor in any given situation depends on a range of factors including reagent
35 availability and cost and the composition of the iron ore. For example, generally caustic soda will be preferred in

- 6 -

situations where the more reactive nature of acid for other constituents in iron ore is an issue.

5 The leaching step (b) may be a heap leaching step or any other suitable leaching step.

10 The leaching step (b) may comprise collecting leach liquor from a base of the heap, separating phosphorus from the collected leach liquor, and re-using the leach liquor.

The washing step (c) may be carried out using any suitable wash liquor, such as water.

15 Implementation of the process may involve multiple plants at a range of locations.

Heap leach facilities may be included in new mines and may be added to existing process plants.

20 According to the present invention there is also provided a commercial iron ore product having a required iron composition that has been produced by treating iron ore in accordance with the above process to lower the phosphorus concentration of the iron ore.

25

The term "commercial iron ore product" is understood herein to mean that the iron ore is in a form for sale to customers, such as steelmakers.

30 According to the present invention there is also provided a process for producing a commercial iron ore product having a required iron composition that comprises blending amounts of different iron ores having different compositions and producing the commercial iron ore

35 product, with at least one of the iron ores used in the blend being an iron ore that has been treated by the

- 7 -

above-described process to lower the phosphorus concentration of the iron ore.

According to the present invention there is also
5 provided a process for producing a commercial iron ore product having a required iron composition that comprises mining different iron ores having different compositions from a plurality of iron ore deposits, transporting the iron ore to a port, and blending the iron ore in
10 accordance with the process described in the preceding paragraph.

The above-described process to lower the phosphorus concentration of the iron ore may be carried out at the
15 iron ore mine or mines or at the port.

It is relevant to note that a significant driver for optimising iron ore resource development is to maintain or lower the phosphorus concentration of commercial iron ore
20 products (lump and fines), while maintaining target iron ore grades, low levels of hydration, and target concentrations of silica and alumina impurities. The present invention facilitates maintaining or lowering the phosphorus concentration of commercial iron ore products
25 (lump and fines).

The present invention is described further by way of example only with reference to the accompanying Figures, of which:

30

Figure 1 is a flowsheet of one, but not the only, embodiment of the process for removing phosphorus from iron ore in accordance with the present invention;

35

Figure 2 is a graph of phosphorus extraction plotted against roast temperature for an iron ore sample that was

- 8 -

roasted and then leached under process conditions in accordance with the present invention;

Figure 3 is a graph of phosphorus extraction plotted
5 against leach time for a plus 1 mm and minus 8 mm iron ore sample that was roasted and then leached under process conditions in accordance with the present invention; and

Figure 4 is a graph of phosphorus extraction plotted
10 against leach time for a plus 8 mm and minus 30 mm iron ore sample that was roasted and then leached under process conditions in accordance with the present invention.

The process shown in the flowsheet of Figure 1
15 comprises conventional crushing and dry screening of run-of-mine high phosphorus iron ore, such as a goethite-containing high phosphorus ore, from an iron ore deposit to produce a lump stream and a fines stream. Typically, the lump ore and fines have the above-described particle
20 size distributions.

The fines stream is transferred to a fines product stockpile.

25 The lump ore stream is then treated in a suitable roasting step to improve accessibility of leach liquor to phosphorus-containing minerals in the lump ore in a subsequent leaching step. The roasting step may be carried out at a temperature and/or for a time to
30 facilitate removal of up to 60% by weight of the total weight of phosphorus in the feed material in a subsequent leaching step described below. Alternatively, the roasting step may be carried out at a temperature and/or for a time to facilitate removal of at least 85% by weight
35 of the total weight of phosphorus in the feed material in the subsequent leaching step. Typically, the roasting step is carried out at a temperature in a range of

- 9 -

400-500°C for a period of 1-3 hours. Typically, the roasting step is carried out under atmospheric conditions.

5 The treated lump ore is then heap leached in a suitable leaching step to remove phosphorus from the iron ore and thereby beneficiate the iron ore.

10 The heap leaching step comprises heaping the ore on a lined pad, feeding leach liquor to the top of the heap, allowing it to irrigate under gravity through the heap, and collecting the pregnant leach solution at the base of the pad. The leach liquor and leach conditions are selected to leach phosphorus from the ore in the heap. The leach liquor and leach conditions are selected to
15 minimise leaching of iron from the ore. The leach liquor may be an acid or alkali. The heap may be any suitable size, for example upwards of 100,000 tonnes.

20 The leach liquor collected from the base of the heap is processed to remove phosphorus and potentially any other components leached from the ore from the leach liquor to allow re-use of the leach liquor as a recycle stream to the heap. The regenerated leach liquor is transferred to a leach liquor preparation tank and mixed
25 with fresh leach liquor and water, as required.

30 Process options to remove phosphorus and potentially other components from leach liquor include precipitation and solids recovery, producing a phosphorus-rich solid by-product for disposal.

35 Alternatively, if reagent consumption is small or a process of removing impurities from the leach liquor is not possible, the leach liquor would not be recycled.

At the end of the heap leaching step, the beneficiated iron ore is washed in a washing step with

- 10 -

water to at least partially remove leach liquor retained on the iron ore. Typically, this step comprises feeding wash water to the top of the heap and allowing it to irrigate under gravity through the heap. This step ensures that there is minimal, if any, carry-over with the iron ore of leach liquor containing phosphorus, sodium or other elements that are present within or dissolved in the leach liquor and are regarded as undesirable contaminants in steelmaking processes or ultimate product.

The washed iron ore is transferred to a lump product stockpile.

The beneficiated iron ore may be sold as a stand-alone commercial iron ore product having a required iron concentration and required concentrations of other elements to meet customer specifications. Alternatively, the beneficiated iron ore may be blended with iron ores having different phosphorus concentrations from the same or multiple iron ore mines to produce a commercial iron ore product having a required iron concentration and required concentrations of other elements to meet customer specifications. Typically, the blending operation is carried out at a port from which commercial iron ore products are shipped to customers. Typically, the iron ore is transported from the mine sites to the port via a rail network.

The process described in the flowsheet of Figure 1 may be carried out at mine sites. Equally, the process steps of roasting and heap leaching and washing iron ore shown in the flowsheet may be carried out at a port, for example, in close proximity to a blending operation.

The present invention is described further with reference to the following examples.

Example 1

Bench scale testwork was carried out on plus 1 mm and minus 8 mm high phosphorus iron ore. The assay of the iron ore was comparable to the assays of the iron ore samples tested in Examples 2 and 3. Samples of the iron ore were added to a pre-heated furnace and crucible and roasted for 30 minutes at different selected temperatures, namely 450°C, 650°C, 850°C, and 1250°C. The samples were removed and cooled naturally. Each roasted sample was transferred to a 2 L bottle and mixed with 0.25M NaOH at 40% solids pulp density. Each bottle was sealed and rolled to provide agitation for a total time of 5 days (120 hours). At the completion of the test, the iron ore samples were filtered, washed with 500 mL of de-ionised water twice, dried and assayed. The wash water was also assayed to complete the mass balance. The results are summarised in Figure 2.

Figure 2 shows that the phosphorus extraction increased with roast temperature and that there was a greater rate of increase at temperatures above 400°C.

Example 2

A 1kg sample of plus 1 mm and minus 8 mm high phosphorus iron ore was added to a pre-heated furnace and crucible and roasted for 30 minutes at 450°C. It was then removed and cooled naturally. The roasted sample was then transferred to a 2 L bottle and mixed with 0.25M NaOH at 40% solids pulp density. The bottle was sealed and rolled to provide agitation for a total time of 6 days (144 hours) with regular solution samples taken for the duration of the test. At the completion of the test, the iron ore was filtered, washed with 500 mL of de-ionised water twice, dried and assayed. The wash water was also assayed to complete the mass balance.

- 12 -

The results are summarised in the Tables set out below, with the results for the post-roast assay and the elemental extractions relating to the end of the 144 hours.

Summary of test masses

Feed Mass (g)	1029.38
Residue Mass (g)	1004.2
Caustic Consumption (kg/t)	6.15

Summary of feed and residue assays of key elements and compounds

	Fe	P	SiO ₂	Al ₂ O ₃	Na
Pre-Roast Assay wt.%	62.9	0.125	1.95	1.20	0.000
Post-Roast Assay wt.%	65.3	0.128	1.99	1.30	0.000
Residue Assay (Size by Grade) wt.%	64.6	0.101	1.73	0.98	0.000

Summary of extractions of key elements and compounds

	Fe	P	SiO ₂	Al ₂ O ₃
Extraction: Feed and Residue (Size by Grade) wt.%	3.47%	23.17%	15.44%	26.75%
Extraction: Feed (Size by Grade) and Liquor wt.%	0.00%	22.42%	1.39%	4.19%
Extraction: Re-calc Head (Size by Grade) and Liquor wt.%	0.00%	22.59%	1.61%	5.41%

Figure 3 is a graph that shows the phosphorus extraction from the sample as a percentage of the total weight of phosphorus in the sample versus leach time and

- 13 -

the concentration of phosphorus (in g/L) in solution after the leach step versus leach time. It is evident from the Figure that the phosphorus extraction increased quickly in the first 20 hours of the leach step and then increased at a much slower rate over the remainder of the leach period. It is also evident from a comparison of the phosphorus extraction data in the Figure and the base data point shown in Figure 2 for the sample of a similar iron ore that was not roasted (phosphorus extraction of around 5%) that the combination of the roasting step and the leach step of Example 2 in accordance with one embodiment of the process of the present invention is an effective process for lowering the concentration of phosphorus in the iron ore of the sample. It is also evident from the Tables that there was substantially no loss of iron from the iron ore.

Example 3

A 10kg sample of plus 8 mm and minus 31.5 mm higher phosphorus iron ore was roasted in a preheated furnace and crucible for 30 minutes at 450°C. It was then removed and cooled naturally. The roasted iron ore was loaded into a column 100 mm in diameter and 1 m high. The loaded column was filled with 0.25M NaOH solution until all the iron ore was submerged in solution. This required approximately 4 L of solution. The column was then sealed and run for 55 days. At regular intervals throughout the test, the solution was drained from the column, mixed, sampled, assayed and adjusted to maintain 0.25M NaOH. At the completion of the leach, the column was drained and filled with de-ionised water. The de-ionised water was drained from the column after 16 hours, sampled and assayed. This washing procedure was then repeated. After washing, the iron ore was removed from the column, dried and assayed.

- 14 -

The results are summarised in the Tables set out below, with the results for the residual assay and the elemental extractions relating to the end of the 55 days.

Summary of test masses

Feed Mass (g)	10392.28
Residue Mass (g)	10257.24
Caustic Consumption (kg/t)	6.65

Summary of feed and residue assays of key elements and compounds

	Fe	P	SiO ₂	Al ₂ O ₃	Na
Feed Assay wt.%	61.116	0.142	2.416	1.487	0.000
Residue Assay (Size by Grade) wt.%	63.352	0.128	2.013	1.232	0.171

Summary of extractions of key elements and compounds

	Fe	P	SiO ₂	Al ₂ O ₃
Extraction: Feed and Residue (Size by Grade) wt.%	-2.31%	11.07%	17.75%	18.24%
Extraction: Feed (Size by Grade) and Liquor wt.%	0.00%	23.87%	0.75%	2.46%
Extraction: Re-calc Head (Size by Grade) and Liquor wt.%	0.00%	21.16%	0.90%	2.92%

5

Figure 4 is a graph that shows the phosphorus extraction from the sample as a percentage of the total weight of phosphorus in the sample versus leach time and the concentration of phosphorus (in g/L) in solution after the leach step versus leach time. It is evident from the Figure that the phosphorus extraction increased quickly in

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- 15 -

the first 20 hours of the leach step and then increased at a much slower rate over the remainder of the leach period. It is also evident from a comparison of the phosphorus extraction data in Figure 4 and the base data point shown
5 in Figure 2 for the sample of a similar iron ore that was not roasted (phosphorus extraction of around 5%) that the combination of the roasting step and the leach step of Example 3 in accordance with one embodiment of the process of the present invention is an effective process for
10 lowering the concentration of phosphorus in the iron ore of the sample. It is also evident from the Tables that there was substantially no loss of iron from the iron ore.

Many modifications may be made to the embodiment of
15 the process of the present invention described in relation to Figure 1 without departing from the spirit and scope of the invention.

By way of example, whilst the embodiment of the
20 process shown in the flowsheet of Figure 1 treats lump ore only, the present invention is not so limited and extends to treating feed material ranging from run-of-mine ore to lump ore and fines.

By way of example, whilst the embodiment of the
25 process shown in the flowsheet of Figure 1 is described in the context of treating iron ore that has been dry crushed and screened, the present invention is not so limited and extends to concentrates of iron ore.

30

By way of example, whilst the embodiment of the
process shown in the flowsheet of Figure 1 includes heap leaching roasted ore under particular conditions including regenerating used leach liquor, the present invention is
35 not so limited and extends to any suitable type of leaching roasted ores.

- 16 -

By way of example, whilst the embodiment of the process shown in the flowsheet of Figure 1 treats goethite-containing iron ore, the present invention is not so limited and extends to treating other iron ores.

- 17 -

CLAIMS

1. A process for removing phosphorus from iron ore or a concentrate of iron ore having a concentration of at least 0.05 wt.% phosphorus that comprises:

(a) roasting a feed material comprising iron ore or upgraded concentrate of iron ore having a phosphorus concentration of at least 0.05 wt.% to improve the accessibility of a leach liquor to phosphorus in the ore;

(b) leaching phosphorus from the roasted iron ore with a leach liquor; and

(c) washing leached iron ore to at least partially remove leach liquor retained on the iron ore.

2. The process defined in claim 1 wherein the roasting step (a) is carried out at a temperature and/or for a time to facilitate increased removal of at least a part of the phosphorus in the feed material in the subsequent leaching step (b).

3. The process defined in claim 2 wherein the roasting step (a) is carried out at a temperature and/or for a time to facilitate removal of up to 60% by weight of the total weight of phosphorus in the feed material in the subsequent leaching step (b).

4. The process defined in claim 1 wherein the roasting step (a) is carried out at a temperature and/or for a time to facilitate removal of substantially all, i.e. at least 85 %, by weight of the total weight of phosphorus in the feed material in the subsequent leaching step (b).

- 18 -

5. The process defined in any one of the preceding claims wherein the roasting step (a) is carried out at a temperature in a range of 400-1200°C.

5 6. The process defined in claim 5 wherein the temperature is less than 1200°C.

7. The process defined in claim 6 wherein the temperature is less than 500°C.

10

8. The process defined in any one of claims 5 to 7 wherein the temperature is greater than 350°C.

9. The process defined in any one of the preceding
15 claims wherein the roasting step (a) is carried out for a roast time of less than 3 hours.

10. The process defined in any one of the preceding claims wherein the feed material is an iron ore that
20 contains at least some goethite.

11. The process defined in any one of the preceding claims comprises separating run-of-mine iron ore into lump and fines iron ore streams and treating one or both
25 streams as the feed material in roasting step (a) and leaching step (b) without additional grinding or milling of the lump or fines streams.

12. The process defined in any one of the preceding
30 claims further comprises regenerating the leach liquor from the leaching step (b) and re-using the leach liquor.

13. The process defined in any one of the preceding claims wherein the leach liquor for the leaching step (b)
35 comprises caustic soda or an acid.

- 19 -

14. The process defined in any one of the preceding claims wherein the leaching step (b) is a heap leaching step.

5 15. The process defined in any one of the preceding claims wherein the leaching step (b) comprises collecting leach liquor from a base of the heap, separating phosphorus from the collected leach liquor, and re-using the leach liquor.

10

16. A commercial iron ore product that has a required iron composition that has been produced by treating iron ore in accordance with the process defined in any one of the preceding claims to lower the phosphorus concentration
15 of the iron ore.

17. A process for producing a commercial iron ore product having a required iron composition that comprises blending amounts of different iron ores having different
20 phosphorous compositions and producing the commercial iron ore product, with at least one of the iron ores used in the blend being an iron ore that has been treated by the process defined in any one of claims 1 to 15 to lower the phosphorus concentration of the iron ore.

25

18. A process for producing a commercial iron ore product having a required iron composition that comprises mining different iron ores having different compositions, from a plurality of iron ore deposits, transporting the iron ore
30 to a port, and blending the iron ore in accordance with the process defined in any one of claims 1 to 15.

Figure 1

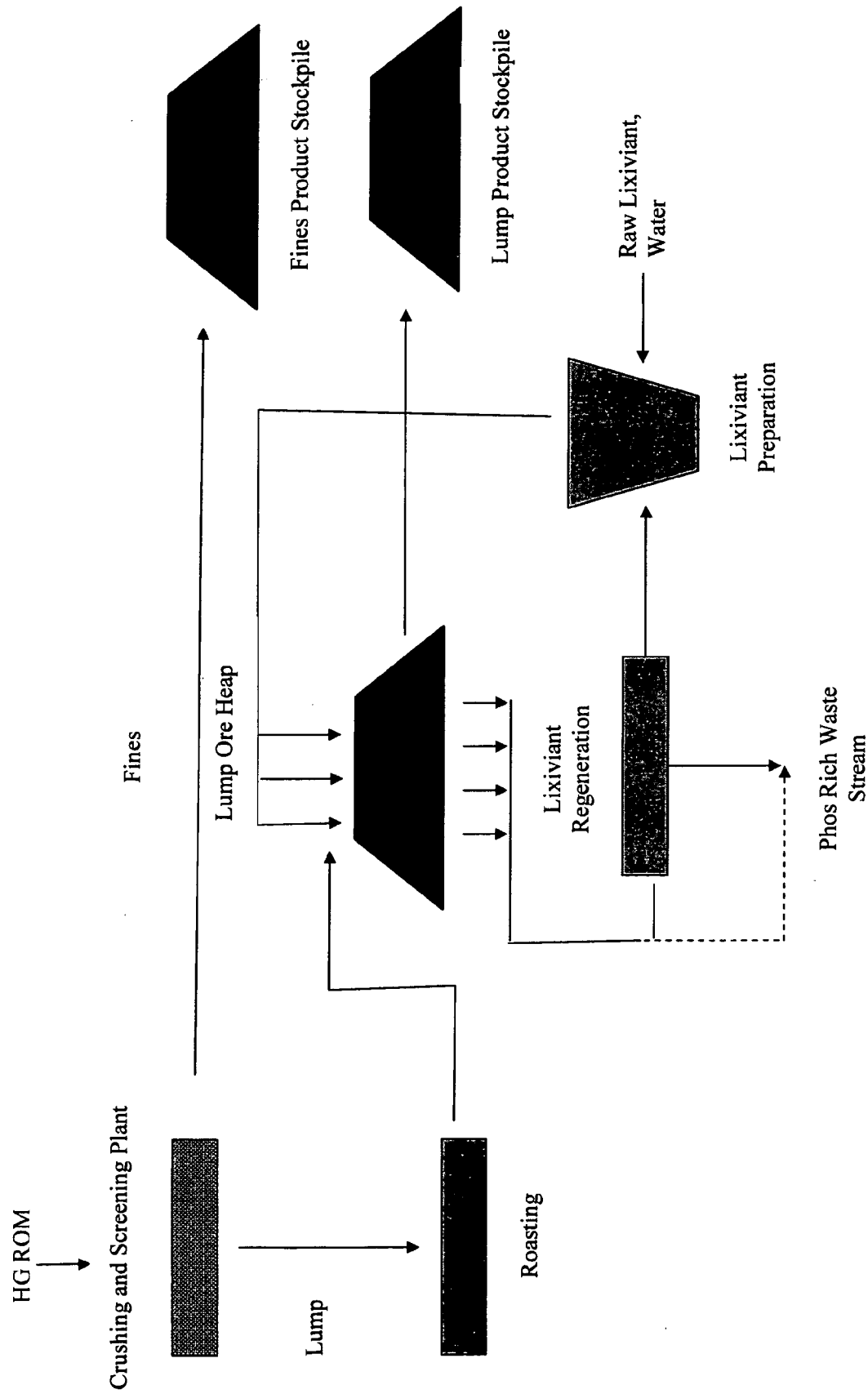


Figure 2

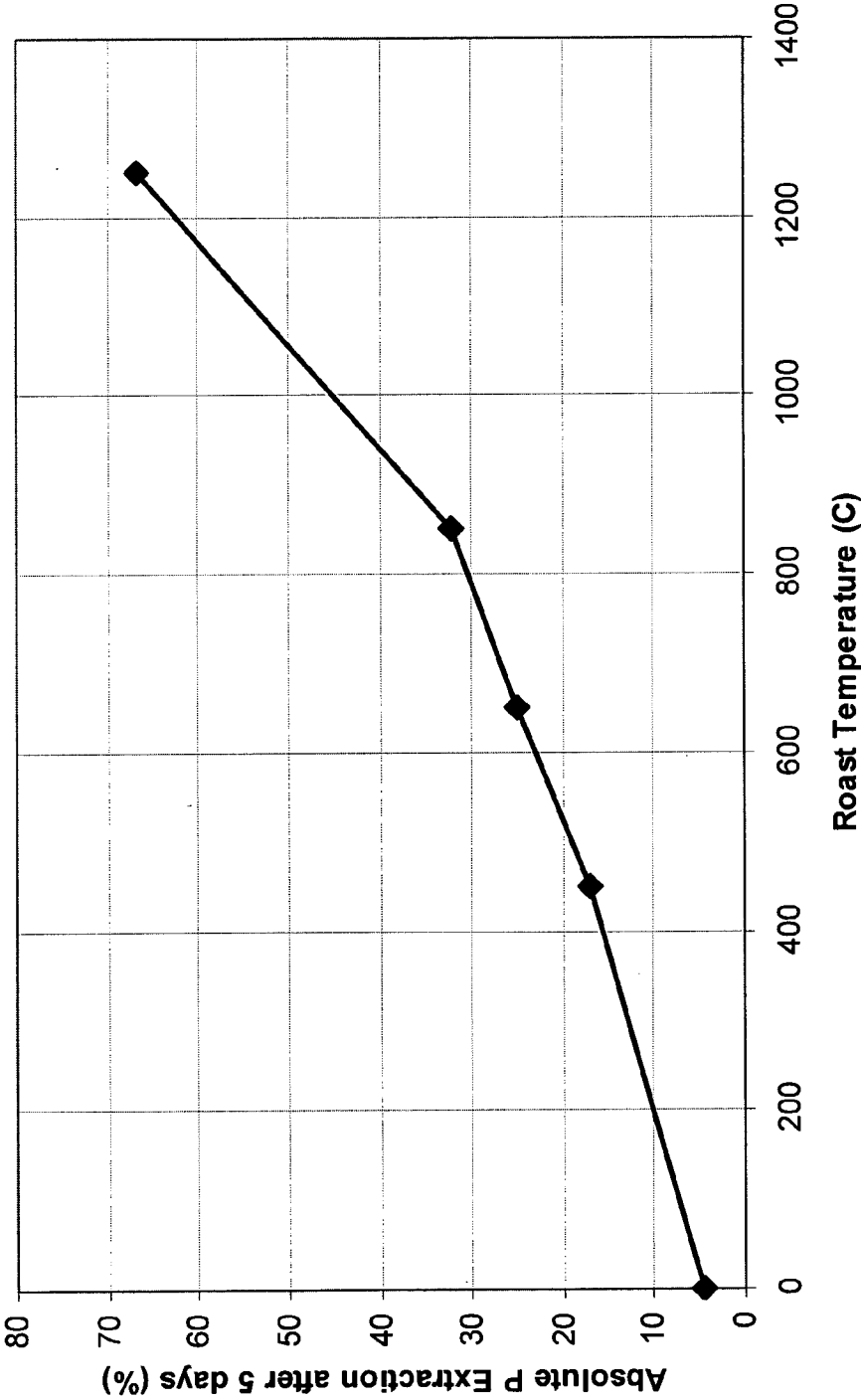


Figure 3

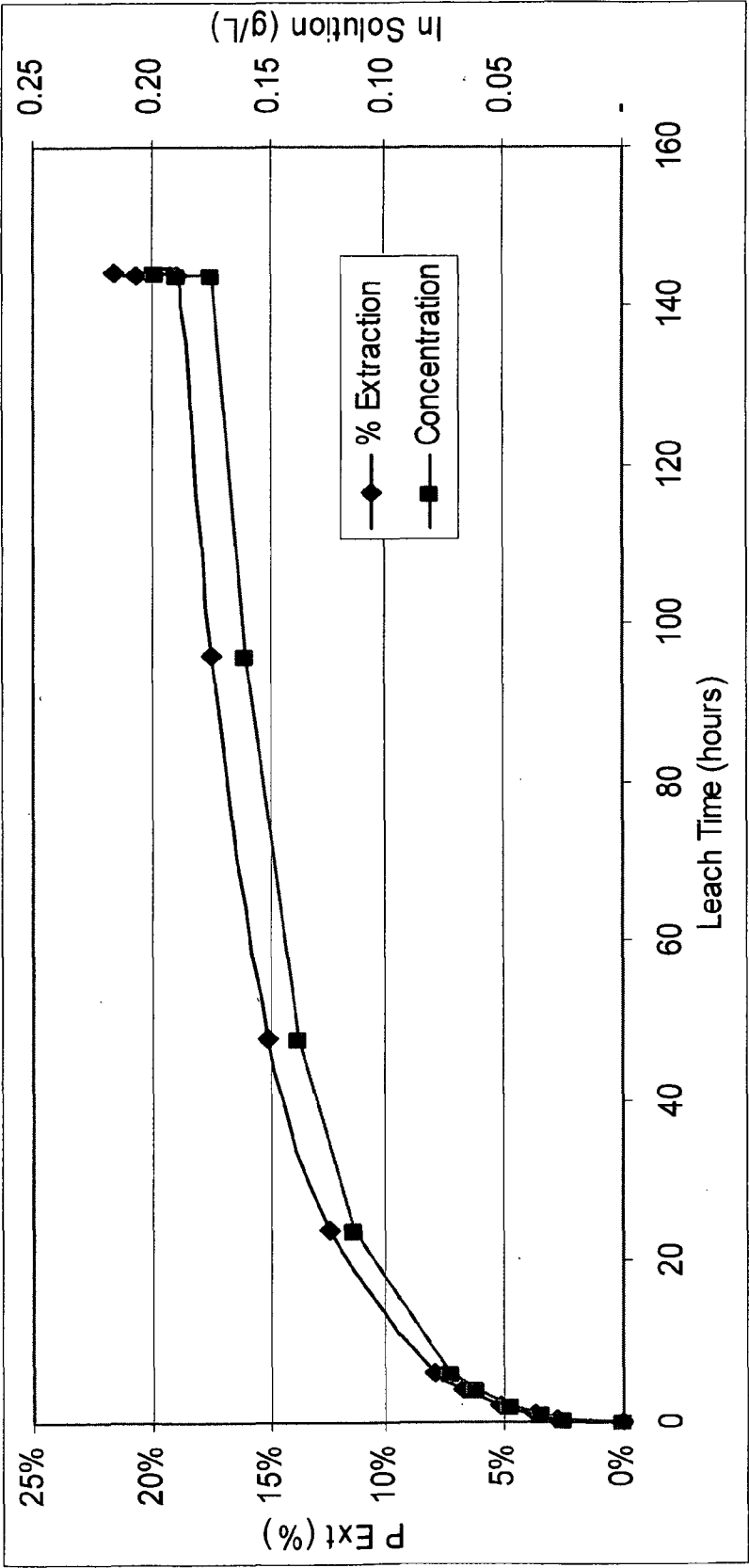
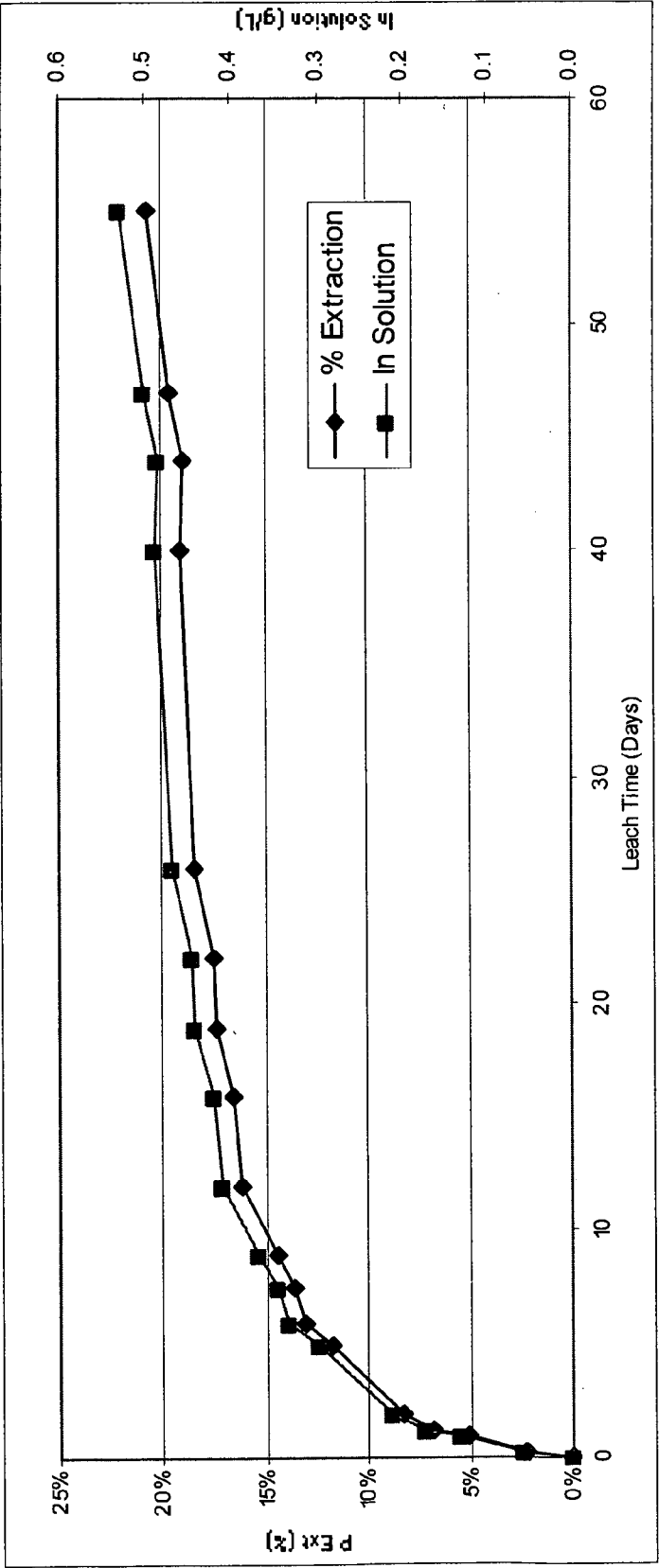


Figure 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/000954

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

C22B 3/04 (2006.01)

C22B 1/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC - C22B 1/02, C22B 3 & Keywords ((IRON W ORE) OR HEMATITE OR HAEMATITE OR MAGNETITE OR GOETHITE OR APATITE, PHOSPHOROUS OR "P")

WPI, EPODOC & Keywords ((IRON W ORE) OR HEMATITE OR HAEMATITE OR MAGNETITE OR GOETHITE OR APATITE) AND (PHOSPHOROUS OR "P") AND (ROAST+) AND (LEACH+) AND (WASH+))

GOOGLE PATENTS & Keywords (IRON, ORE, LEACHING, PHOSPHOROUS)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1367102 A (AUSTRALIAN MINERAL DEV LAB) 18 September 1974 See page 1, lines 11 – 42; page 2, line 7 – page 4, line 15; examples 1 – 5	1 – 18
X	WO 1993 / 010271 A2 (MINERAC O DA TRINDADE SAMITRI [BR]) 27 May 1993 See page 1, line 18 – page 5, line 18	1 – 18
Y	GB 1115949 A (FORACO Y PROYECTOS S A) 6 June 1968 See page 1, lines 9 – 11 & 77 – 85; page 2, line 29 – page 3, line 9	1 – 2, 5 – 9, 12 – 13



Further documents are listed in the continuation of Box C



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"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search
02 September 2009

Date of mailing of the international search report

9 SEP 2009

Name and mailing address of the ISA/AU
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaustalia.gov.au
Facsimile No. +61 2 6283 7999

Authorized officer
VIJAYA MATHE
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No : (02) 6225 6162

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/000954

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2435649 A (ANGLO OPERATIONS LTD [ZA]) 5 September 2007 See abstract; claims 1 – 5	1 – 2, 5 – 9, 12 – 13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2009/000954

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	1367102	AU	35472/71	DE	2155912	FR	2113910
WO	9310271	AU	91117/91	BR	9105035		
GB	1115949	DE	1508021	FR	1505100	GB	1150325
GB	2435649	AU	2007220274	CA	2642968	CN	101395286
		EP	2004868	KR	20080109808	MX	2008010959
		NO	20084154	WO	2007099315		
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.							
END OF ANNEX							