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**Datasheet for the decision
of 18 February 2011**

Case Number: T 0163/09 - 3.2.08

Application Number: 01928333.2

Publication Number: 1272680

IPC: C22B 23/00

Language of the proceedings: EN

Title of invention:

Heap leaching of nickel containing ore with sulfuric acid

Patent Proprietor:

BHP Minerals International, Inc.

Headword:

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Relevant legal provisions:

EPC Art. 56, 84, 123(2)(3)

Relevant legal provisions (EPC 1973):

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Keyword:

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Decisions cited:

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Catchword:

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Case Number: T 0163/09 - 3.2.08

DECISION
of the Technical Board of Appeal 3.2.08
of 18 February 2011

Appellant: BHP Minerals International, Inc.
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Representative: Rees, David Christopher
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 20 November 2008
revoking European patent No. 1272680 pursuant
to Article 101(2) and 101(3)(b) EPC.

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
E. Dufrasne

Summary of Facts and Submissions

- I. In its decision dated 20 November 2008, the opposition division revoked European patent No. 1 272 680.

The opposition division held, amongst other things, that the subject matter of claim 1 of the patent as granted (main request) lacked an inventive step with respect to the cited prior art (Article 56 EPC). The amendments to claim 1 of the auxiliary request then on file were held to extend the scope of protection beyond the scope of claim 1 as granted and thus to violate Article 123(3) EPC.

In its decision the opposition division focused inter alia on the following documents:

D4: US-A-5 571 308

D6: FR-A-2 593 193

D38: Steven S. Zumdahl: "Chemistry", Third Edition, 1993, ISBN 0-669-32866-9, page 105.

- II. The patent proprietor lodged an appeal against the decision. The appeal was received at the European Patent Office on 19 January 2009 and the appeal fee was paid on the same date.

The statement setting out the grounds of appeal was received on 27 March 2009.

In its statement, the appellant requested that

the decision under appeal be set aside and the patent be maintained on the basis of

- the claims as granted, with claim 1 additionally limited to the subject matter of claim 2 (main request) or, alternatively,
- the claims of the auxiliary request submitted on 30 September 2008, as attached to the impugned decision.

Should the Board not agree to either of the requests, oral proceedings were requested.

- III. By its letter dated 13 August 2010, the respondent (opponent) withdrew its opposition and is, therefore, no longer a party to the proceedings.
- IV. In the official communication annexed to the summons to oral proceedings, the Board gave a detailed preliminary assessment of the case.
- V. In its response dated 14 January 2011, the appellant withdrew its request for oral proceedings and requested a decision based on the written submissions.
- VI. Independent claim 1 of the main request reads:

"A method of operating a heap leach process for leaching nickel from a laterite ore containing a substantial clay component, comprising:
 - a. forming at least one heap from a mixture of the ore and concentrated sulfuric acid, wherein the mixture is in the form of agglomerated particles;
 - b. applying a leaching solution of between 0.1% to 20% sulfuric acid to the top of the heap at a first

predetermined average flux rate wherein a leach liquor is formed at a bottom of the heap; and,
c. directing the leach liquor output from step (b) into a product liquor sump for direct delivery to a processing plant for substantially extracting nickel values, wherein the ore contains at least 10% by weight of the clay component."

Claim 1 of the auxiliary request reads as follows (the features which have been added to claim 1 of the patent as granted are written in bold):

"A method of operating a heap leach process for leaching nickel from a laterite ore containing a substantial clay component **of at least 10% by weight**, comprising:

- a. forming at least one heap from a mixture of the ore and concentrated sulfuric acid **having a concentration of at least 50%**, wherein the mixture is in the form of agglomerated particles;
- b. applying a leaching solution of between 0.1% to 20% sulfuric acid to the top of the heap at a first predetermined average flux rate wherein a leach liquor is formed at a bottom of the heap; and,
- c. directing the leach liquor output from step (b) into a product liquor sump for direct delivery to a processing plant for substantially extracting nickel values."

VII. The appellant's arguments can be summarized as follows:

Claim 1 of the patent as granted used the term "concentrated sulphuric acid" but did not state explicitly what concentration range this expression was

intended to cover. It was however clearly evident from paragraph [0043] of the patent specification that within the scope of the invention a sulphuric acid having a concentration of at least 100 g/l acid was contemplated. The passage also showed that a concentration of at least 50% was preferred, while a concentration of 93 to 98% was even more preferred. Thus, the expression "concentrated sulphuric acid" in claim 1 had to be understood as being broad enough to include all of these possibilities, regardless what might be written in any prior art document. The assumption by the opposition division that the term "concentrated sulphuric acid" should exclusively mean a concentration range of 93 to 98% was therefore unjustified.

Document D4, representing the closest prior art, was concerned with heap leaching nickel from a lean ore but not from one with a clay content of at least 10% as set out in claim 1 of the patent. The known process used sulphuric acid, both to leach and to agglomerate, however the agglomeration step used dilute sulphuric acid.

Starting from D4, the objective problem underlying the patent under consideration was to provide agglomerated particles (pellets) exhibiting sufficient strength to withstand pressure at the base of the heap up to 10 m while at the same time having sufficient permeability to allow effective leaching. This problem was solved by the use of concentrated sulphuric acid for the agglomeration step, preferably in a concentration of at least 50% as stipulated in claim 1 of the auxiliary request. The claimed use of concentrated sulphuric acid

in the agglomeration step was neither shown nor suggested anywhere in the prior art. The process set out in claim 1 was therefore novel.

The statement made by the opposition division in its decision that, starting from D4, the person skilled in the art would find in document D6 an incentive to use (concentrated) sulphuric acid in place of sulphuric acid and arrive at the subject matter of claim 1 was unjustified. There was no clear teaching in document D6 of the use of sulphuric acid at a concentration of at least 50% for pelletization. To the contrary, according to document D6 sulphuric acid could be used together with water, but water was essential and sulphuric acid was merely optional.

The subject matter of claim 1 of the main request and of claim 1 of the auxiliary request therefore involved an inventive step.

Turning to the objection under Article 123(3) EPC raised in the impugned decision against claim 1 of the auxiliary request, reference was made again to paragraph [0043] of the patent specification. Since, contrary to the position of the opposition division, the expression "concentrated sulphuric acid" as used in the patent was not restricted to 93 to 98%, a limitation of the concentration to at least 50% in claim 1 of the auxiliary request was not a broadening amendment and therefore did not offend Article 123(3) EPC.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Interpretation of claim 1

2.1.1 Claim 1 of the main request relates to a heap leaching process for leaching nickel from a laterite ore containing at least 10% by weight of a clay component (having a particle size of < 44 microns); (see paragraphs [0033], [0040] of the patent specification). The claimed method comprises, amongst others, the steps of:

(a) providing a mixture of ore particles and concentrated sulfuric acid;

(b) forming agglomerated particles (i.e. pellets).

To the Board's understanding, which is supported for instance by the definition given in the textbook D38, page 105, paragraph 3, step (a) of the claimed process means that a substance commercially sold as "concentrated sulphuric acid" and typically comprising 98% H₂SO₄ is mixed with the ore and that the mixture is pelletized. No other evidence is available to the Board to justify a different interpretation. Consequently, the skilled person putting into practice the process set out in claim 1 would use sulphuric acid having a concentration of 98% rather than "diluted sulphuric acid" comprising 10% (106 g/l) when providing the mixture of step (a).

2.1.2 As to the meaning of the technical term "concentrated sulphuric acid" featuring in claim 1, the appellant pointed to paragraph [0043] of the patent specification to support its position: within the scope of the patent under consideration the term "concentrated sulphuric acid" encompassed concentrations of at least 100 g/l acid and 50% irrespective of other technical definitions given elsewhere.

It is however noted that the passage in paragraph [0043] of the patent specification does not use the technical term "concentrated sulphuric acid". It only describes that "*the ore is pelletized by mixing the ore with sulfuric acid having a concentration of at least 100 g/l acid, preferably 50% and more preferably 93-98%*". The general term "sulfuric acid" in the passage actually encompasses both "concentrated" and "non-concentrated, dilute" levels of H₂SO₄ and therefore leads to the conclusion that H₂SO₄ of at least 100 g/l acid could be used for the pelletizing step.

The person skilled in the art is however undoubtedly aware of the fact that the technical term "concentrated sulfuric acid" featuring in claim 1 of the patent complies with the most preferred embodiment, i.e. a concentration range of 93 to 98% H₂SO₄, which is also referred to in this paragraph. The skilled reader of the patent specification finds confirmation in example 2, which mentions in paragraph [0069] that the crushed "*ore was agglomerated (pelletized) by mixing sulfuric acid having a concentration of 93 to 98% with the ore in a rotary mixer to form stable pellets*". There is no information whatsoever in the patent specification suggesting or implying that the term

"concentrated sulphuric acid" should have any special meaning different from the ordinary meaning as understood by the person skilled in the art.

2.1.3 The Board therefore concurs with the position of the opposition division as regards the interpretation of the term "concentrated sulfuric acid".

2.2 Inventive step

2.2.1 The problem underlying the patent at issue resides in the poor percolation resulting from the absorbent nature of the clay constituents in the laterite ore, which, when wetted with the leach solution for recovering nickel (and possibly cobalt), swells and "clogs" and thus requires an undesirably long leaching time.

The claimed method solves the problem by pre-treating the crushed laterite ore with concentrated sulfuric acid, agglomerating the mixture (forming pellets), optionally followed by a curing step to harden the pellets, and heap leaching (see the patent specification, paragraphs [0025] and [0026]).

2.2.2 The poor permeability or the "clogging" problem, respectively, associated with the leaching of "clay-type" ore with H_2SO_4 as the lixiviant for recovering nickel (or other metals) is known in the art and addressed in document D4, column 7, lines 1 to 8. In order to cope with it, document D4 clearly teaches the pelletization of the lateritic ore as being an important expedient for assuring uniform distribution of the (leaching) reagent throughout the heap and for

providing pellets having sufficient shape and integrity to resist gravimetric flow and yet to assure the desired permeability for irrigation or percolation of the reagent solution through the heap. In the example given in document D4, column 9, lines 25 to 43, lateritic ore having a particle size of less than 1 inch was mixed with 18% sulfuric acid (180 g/l) and formed into pellets. This means that "dilute" sulphuric acid was used for agglomeration.

Even if, as insisted upon by the appellant in its submissions, the term "concentrated" sulfuric acid were to include a concentration ranging down to at least 100 g/l (about 10 wt%) sulfuric acid, this technical feature is in any case already anticipated by the disclosure of document D4. Further, no inventive distinction can be seen in whether or not the "clay type" ore treated by the known process actually includes less than 10% clay or more. In particular, the patent in suit does not describe any technical effect connected to this range. Given this situation, the process set out in claim of the main request would not involve an inventive step vis-à-vis the disclosure of document D4 taken individually.

- 2.2.3 In its broadest aspect, heap leaching of clay-type laterite ores with sulphuric acid for recovering various metals including nickel, cobalt, copper and/or uranium is well known in the art (reference is made in this context to the patent specification, page 5, lines 1 to 7 which mentions the leaching of Ni and Co).

Document D6 deals with a process of acid leaching copper and uranium (see D6, page 1, lines 4 to 34, in

particular lines 25 to 27; page 2, lines 6 to 16; page 3, lines 7 to 9). As emphasized in document D4, the step of pelletizing the clay-type ore by using water and an acid is described in document D6 as an indispensable pre-condition in order to improve the percolation and, in consequence thereof, the leaching yield (see D6, page 5, lines 24 to 29). For compatibility reasons, the acid used as a wetting agent for agglomerating (pelletizing) the ore should be the same as in the leaching step (see D6, page 9, lines 1 to 25). The initial concentration of the acid (preferably sulphuric acid) used for pelletizing may vary between 30 g/l and 1800 g/l (see D6, page 10, lines 14 to 17). In the more preferred embodiment disclosed in D6 on page 11, lines 5 to 8, the acid used for the pelletizing step should be at least in part in the form of "concentrated" acid, whereas "diluted" acid should be used for leaching the ore. In the most preferred embodiment described in D6, page 18, lines 22 to 30, the initial acid concentration used for pelletizing the ore is 1800 g/l, which corresponds to the industrial concentration of about 97%. Hence the addition of sulphuric acid in a highly concentrated form during the pelletizing step is generally known in art, irrespective of whether the process relates to leaching nickel, nickel + cobalt, copper and/or uranium. Consequently, the process set out in claim 1 of the main request does not involve an inventive step having regard to the combined teaching of documents D4 and D6.

3. Auxiliary request

3.1 Claim 1 of the auxiliary request has been amended to include the wording "**concentrated** sulfuric acid having

a concentration of at least 50%". Firstly, the wording is regarded as being self-contradictory, since - as previously shown - the technical term "concentrated sulfuric acid" excludes concentrations as low as 50% by weight. Secondly, the wording of claim 1 of the auxiliary request would extend the scope of protection afforded by claim 1 of the patent as granted in that it encompasses lower concentration ranges for H₂SO₄ not covered by claim 1 of the patent as granted.

Objections therefore arise under Articles 84 and 123(3) EPC.

- 3.2 Additionally, it is noted that paragraph [0043] of the patent specification, upon which the appellant based its arguments in this context, discloses "*sulfuric acid (and not: concentrated sulfuric acid) having a concentration of at least 100g/l acid, preferably 50% and more preferably 93 to 98%*". The passage does not disclose a range of "at least 50%" as defined in claim 1 of the auxiliary request.

Objection therefore also arises under Article 123(2) EPC.

4. By the Board's preliminary assessment of the case, which was summarized in the official communication annexed to the summons to oral proceedings, the appellant was informed about the objections and arguments given in the preceding paragraphs. The appellant however dispensed with presenting any counter-arguments or statements in response to the Board's provisional opinion.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

V. Commare

T. Kriner