Title: ALKALINE AND ACID PRESSURE OXIDATION OF PRECIOUS METAL-CONTAINING MATERIALS

Abstract: The present invention is directed to a precious metal recovery process in which an acid sulfidic feed material is subjected to acid pressure oxidation and an alkaline sulfidic feed material is subjected to alkaline pressure oxidation, with the discharge slurries from the pressure oxidation processes being combined to reduce neutralization requirements prior to precious metal recovery.
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, US, UZ, VC, VN, ZA, ZM, ZW.

**Designated States (unless otherwise indicated, for every Mad of regional protection available):** ARIPPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

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**Date of publication of the international search report:** 26 July 2012
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

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

- IPC(8): C22B 11/00 (2012.01)
- USPC: 75/744; 75/71 1

B. FIELDS SEARCHED

- Minimum documentation searched (classification system followed by classification symbols)
  - IPC(8): C22B 11/00 (2012.01)
  - USPC: 75/744; 75/71 1

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

USPC: 75/710; 75/741

C. DOCUMENTS CONSIDERED □ BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 2009/0071296 A1 (Hiller et al.) 19 March 2009 (19.03.2009), especially, para [0020], [0030], [0034], [0043], [0044], [0048], [0050], [0051], [0055], [0098] and [0106].</td>
<td>1-3, 5, 8-1 1, 16-19, 24</td>
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<td>A</td>
<td>US 2009/0074608 A1 (Hiller et al.) 19 March 2009 (19.03.2009), especially, para [0011]-[0014] and [0054]-[0056].</td>
<td>1-3, 5, 8-1 1, 16-19, 24</td>
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<tr>
<td>A</td>
<td>US 2009/071295 A1 (Gorain et al.) 19 March 2009 (19.03.2009), especially, para[0024].</td>
<td>1-3, 5, 8-1 1, 16-19, 24</td>
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<tr>
<td>A</td>
<td>US 2007/0137437 A1 (Choi et al.) 21 June 2007 (21.06.2007), especially, para [0020]-[0052].</td>
<td>1-3, 5, 8-1 1, 16-19, 24</td>
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</table>

Further documents are listed in the continuation of Box C.

- "A" document defining the general state of the art which is not considered to be of particular relevance.
- "E" earlier application or patent but published on or after the international filing date.
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).
- "O" document referring to an oral disclosure, use, exhibition or other means.
- "P" document published prior to the international filing date but later than the priority date claimed.
- "X" 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.
- "Y" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.
- "Z" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "S" document member of the same patent family.

Date of the actual completion of the international search: 21 May 2012 (21.05.2012)

Date of mailing of the international search report: 30 MAY 2012

Name and mailing address of the ISA/US:

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Authorized officer: Lee W. Young
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PCT DSP: 571-272-7774

Form PCT/ISA/2 10 (second sheet) (July 2009)
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.:
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.:
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

—See Extra Sheet—

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. □ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-24

Remark on Protest

□ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.
□ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.
□ No protest accompanied the payment of additional search fees.
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-24 directed to a process, comprising:

(a) pressure oxidizing, at a pH of less than pH 6.5, an acid generating feed material comprising a valuable metal and sulfide sulfur to form an acid discharge slurry comprising sulfate sulfur and having a first pH of less than pH 6.5;
(b) pressure oxidizing, at a pH of at least pH 6.5, an acid consuming feed material comprising the valuable metal and sulfide sulfur to form an alkaline discharge slurry comprising sulfate sulfur and having a second pH of at least pH 6.5; and
(c) combining the acid and alkaline discharge slurries to provide a combined discharge slurry having a third pH greater than the first pH and less than the second pH.

Group II: claims 25-28 directed to a method, comprising:

- providing an aqueous leach solution comprising a leaching agent;
- passing the aqueous leach solution through a membrane filter to form an aqueous retentate comprising at least most of the leaching agent and an aqueous permeate comprising some of the leaching agent;
- recycling the aqueous retentate to a leaching step;
- destroying at least most of the leaching agent in the aqueous permeate to form an aqueous recycle stream substantially free of leaching agent; and
- recycling the aqueous recycle stream to a unit operation upstream of the leaching step.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

Group II does not include the pressure oxidizing, at a pH of less than pH 6.5, an acid generating feed material comprising a valuable metal of group I.

Group I does not include an aqueous leach solution comprising a leaching agent nor the method of group II.

The common feature of a metal containing material of groups I and II is taught by US 2009/0071296 A1 to Hiller et al. (para [0014]); therefore the common feature is not an improvement over the prior art.

None of these technical features are common to the other groups, nor do they correspond to a special technical feature in the other groups. Therefore, unity of invention is lacking.