Search Exam - Biotech - Patent Infringement Risk Search
Oxidising bacterium

"Having retired from a large multinational your old department occasionally sends you search requests when they are too busy to handle in-house.
An ex-colleague has sent you the following search and would like the results sometime in March.
(You know that she will provide further clarification if you feel the brief is unclear).

Please conduct a freedom to operate to cover Germany, France and the UK on the following:
Continuous bioleaching of copper-containing ore with a bacterium that oxidises sulphur. The process is conducted at a temperature range of 60-80 degrees Celsius, under mechanically agitated conditions, and at a pH maintained at less than 2.5. The pH is controlled by addition of alkaline earth metal carbonates. The process can also include a separation step for iron from the ore."

Search principles

An FTO search is to identify patent records with claims that may cover the process of interest. Typically, this will cover records published in the last 20 years, although this can be viewed as 21 years from application date, or similar versions.

The search is to locate any case that encompasses the subject of interest and should not be restricted to cases describing the specifics.

The exact requirement may vary with request – 'live' cases only may be requested, although 'dead' cases may provide evidence for right of use.

CPC headings may not be assigned to some records. If searches are primarily under CPC headings, an additional strategy using corresponding IPC headings should be considered for records which do not have a CPC.

Search Procedure

It is rarely possible to predict all aspects of the best strategy upfront. The initial search approach should identify the key points of interest in order to focus the initial searches most effectively. A secondary stage of the search can then draw on anything revealed by the initial searches.

Features of interest

Search field of interest
Countries EP, WO, FR, DE, GB
Time period to be covered: records published in the last 20 years.

The technical features of interest:
This should probably be viewed as two different searches under one banner:
- Treatment of copper ore; this can cover ores with low Cu content as worded.
- Bacterial leaching is important, and the bacterium oxidises sulphur.
- Of secondary interest is the pH control being an alkaline earth metal carbonate, and an iron separation stage.

Technical features: copper-containing ore
This can be both generic or specific ores. The wording allows minor Cu content which can lead to classification in other areas, even if the search is focussed on high copper content ores.
It seems reasonable to base initial search strategies on ores primarily containing copper.

Technical features: bacterium
This could also be either generic or specific names.
'oxidising' is not necessarily a good term to use; firstly, the alternative spelling 'oxidizing' is needed, but there are many variants, and can just include 'digesting'.

Search Strategy Preparation 1: Identify classifications
The IPC and CPC are organised on a similar basis; the CPC usually has more subheadings with more specific definitions. Although both can contain different material, it is initially reasonable to start with the CPC, and consider extending the search at a later stage, including using information located as part of the search.

It is preferable that at least part of the strategy is not limited to narrow classifications in order to identify material indexed elsewhere.

There are headings for bioleaching, (not limited specifically to copper ore)

C22B: PRODUCTION AND REFINING OF METALS (electrolytic C25); PRETREATMENT OF RAW MATERIALS
C22B3/00: Extraction of metal compounds from ores or concentrates by wet processes
C22B3/18: **.** with the aid of microorganisms or enzymes, e.g. bacteria or algae

Treatment of Copper ores:

C22B: PRODUCTION AND REFINING OF METALS (electrolytic C25); PRETREATMENT OF RAW MATERIALS
C22B15/00:   Obtaining copper
C22B15/0063: **.** Hydrometallurgy
C22B15/0065: **. .** Leaching or slurrying (with organic compounds C22B3/16)
C22B15/008: . . . With Non-Acid Solutions Containing Salts Of Alkali Or Alkaline Earth Metals

C22B 15/0065 has several subheadings which may be of interest. The parent headings C22B 15/0063 also encompasses the subject matter of interest.

Search Strategy Preparation 2: Keywords
The classification headings may eliminate the need to identify specific ores/bacteria.

Ores and bacteria noted during the search can be used to expand the search later in the process.

Search Strategy Creation
For simplicity, all options will be limited to CPCs and DE, FR, GB, EP, WO records published from 2002-onwards.

> *cpc=c22b3/18*   *223 families*   **Search Option 1a**

From the above strategy, the microorganism treatment heading is not large, and it may be possible to inspect the entire set (**Search Option 1a**). It is likely that the CPC heading indexes pertinent records which do not specifically refer to any one metal ore.

However it is good practice, in order to identify if a search strategy is properly focussed, to use terms for copper to identify the best records in an initial set for review. Searches should cover English, French, German and Latin-based:
e.g. copper, cupric, kupfer, cuivre, Cu
> *cpc=c22b3/18 and (copper or cupric or kupfer or cuivre or cu or cuprous or cuprite or cuprum)   91 families* **Search Option 1b**

Referring to the headings for copper ores:

> *cpc=(c22b15/0063 or c22b15/0065 or c22b15/008)*   *115 families*   **Search Option 2**

This is a small set, and there is no real value in limiting the set further (**Search Option 2**) due to the range of possible terms which may be used.

Combined classification and classification searches:
To avoid the need for a specific keyword to be present, a search using combinations of classification headings should be considered: **Search Option 2a**

> ➢ *cpc=c22b3/18 and cpc=(c22b15/0063 or c22b15/0065 or c22b15/008)   19 families*

NB: The second set is being part of Search Option 2, extend the class combination with combining the C22B 3 and C22B 15 headings.

Keyword search strategies:
The above CPC headings are relatively small in size. This suggests that either there is relatively little art in the field, or art is indexed elsewhere.

Keyword strategies will usually be improved with truncations allowed (* in this example), or by use of proximity terms (not used here).

A keyword only option can be used (**Search Option 3**):
> ➢ *(copper or cupric or kupfer or cuivre or cu or cuprous or cuprite or cuprum) and (ore or ores or mineral*) and (*bacter* or *bacill*)*
> *80 families*

Of those 80 families, 40 of them are indexed in one of the CPC headings in Search Options 1 or 2. A brief review of classifications assigned to the additional 40 references indicates that there is a lot of 'noise' in this set.

For all art located by **Search Option 1** or Search **Option 2**, the vast majority of families are also indexed under Y02P 10/20, relating to metal recycling. This indicates that there may be broader concepts where claims can encompass ore treatment while being indexed as recycling.

Possible Strategy Extensions
The additional cases from Search Option 3, and extended keyword/concept strategy may increase the number of potential relevant results, e.g. for copper ores add the specific ores (Chalcopyrite, Chalcocite,… see WIKI copper ores) and for bacterium add microorganism, abbr. SOB (sulphur oxidizing bacteria), specific bacteria (Aquificota , Bacteroidota, …, see WIKI Sulfur-reducing_bacteria).
The additional cases from Search Option 1 and 3,
> A. combine broad/overarching classification (of ores) with extended concepts/keywords for bacterium (see above)
> B. combine broad/overarching classification (of bacterium, C12N-001/..) with extended concepts/keywords for copper (*copper*, *cupric* or *cuprous* or *kupfer* or cuivre* or Cu or see above)

The additional cases from Search Option 3, and general strategies may indicate additional areas, e.g. CPC Y02P 10/all may be interesting (relating to metal processing).

Potential results (final columns shows which options above they are retrieved by)

EP3034635B1 *(DE,FR,GB live)*	sepn of copper from copper ore, thermophilic bacterium, inoculant at 40-65 degC	1b, 3
EP2215276B1 *(DE,GB live; FR lapsed)*	bioleaching of copper ore, temperature possibly from 55-65 degC	1b, 3
EP1640463 B1 (DE,FR,GB live)	leaching to get copper solution, running at 19-100 degC	2
WO2019213694 A 1 (DE,FR,GB dead)	copper ore leaching (names chalcopyrite, enargite as possible ores) at a temperature <100 degC	1b, 2, 2a
WO12106831A2 *(dead)*	biological leaching of copper ore, 60-150 degC in heap	2, 3
WO0118265A1 *(dead)*	Continuous CuS ore biological leaching at 75-85 degC	1b, 2, 2a, 3
WO2007118257 (dead)	copper from leaching, at 60-80 degC (see claim 8)	1b, 2, 2a

Status information given is at the time of writing (October 2022).
As can be seen, each of the strategies retrieved at least some, with all of them locating one case; a sample search may not locate all.

Find below using the above considerations, to compile two example queries, in a value-add database (DWPI/Derwent innovation, Clarivate) and a Fulltext database (Fampat, Questel).

1. Value add abstract (patent) database(s)

DerwentInnovation (DWPI) Clarivate

1. ALLD=(((*COPPER* OR *CUPROUS* OR *CUPRIC* OR *CUPRIT* OR *CUPRUM* OR CU) NEAR2 (ORE* OR MINERAL*))); [Only English synonyms used for "copper ore" concept; DWPI is an English language database]

2. ALLD=((*COPPER* OR *CUPROUS* OR *CUPRIC* OR *CUPRIT* OR *CUPRUM* OR CU)) AND AIC=(C22B); [replace keyword "ore" for broad IPC/CPC code used for "ore"]

3. ALLD=((CHALCOCITE* OR COVELLITE* OR CHALCOPYRITE* OR BORNITE* OR ENARGITE* OR TETRAHEDRITE* OR CUPRITE* OR TENORITE* OR MALACHITE* OR AZURITE* OR CHALCANTHITE* OR BROCHANTITE* OR CHRYSOCOLLA*));
   [extend "copper ore" concept, can be extended extended using chemical formula]

4. MC=((E35-A) OR (M25))
   [extend "copper ore" concept by Derwent manual codes]

5. ALLD=(((MICROORG* OR (MICRO ADJ ORG*) OR BACTER* OR BACIL*) NEAR9 (*SULF* OR *SULPH* OR THIO* OR *THIOL* OR *MERCAPT*)) OR SOB);

6. ALLD=((MICROORG* OR (MICRO ADJ ORG*) OR BACTER* OR BACIL*));
   [extent Query 5 by deleting the "sulphur" concept]

7. AIC=(C12R OR C12N);
   [replace keyword "microorganism" by broad IPC/CPC code used for "microorganism]

8. PN=(DE OR FR OR GB) OR DS=(DE OR FR OR GB);
   [limit the by publication country and designated states]

9. (1 OR 2 OR 3) AND 5 AND 8
10. (1 OR 2 OR 3) AND 6 AND 8
11. (1 OR 2 OR 3) AND 7 AND 8
12. 4 AND 5 AND 8
13. 4 AND 6 AND 8
14. 4 AND 7 AND 8

Be aware that searching the ALLD field in the value-add database will search all Derwent fields and first claim (so not all claims)!

Query lines 9-14 can be limited by publication date (PY>=2002). In case of a limited number of results, one can opt for no date limitation. The lapsed patent publications (> 20 years) can be used as prior art to invalidate reported potentially relevant patent publications.

2. Full-text (patent) database(s)

FAMPAT (ORBIT)

1. ((+COPPER+ OR +CUPROUS+ OR +CUPRIC+ OR +CUPRIT+ OR +CUPRUM+ or CU) 2D (ORE+ OR MINERAL+))/TI/AB/CLMS   [Only English synonyms used for "copper ore" concept, for now, trust in the machine translation of the German and French terms. However, search can be extended using German and French terms]

2. ((+COPPER+ OR +CUPROUS+ OR +CUPRIC+ OR +CUPRIT+ OR +CUPRUM+ OR CU) 2D (ORE+ OR MINERAL+))/DESC/ODES   [When a generic/broad concept for copper ore is used in the claims, this query covers that broad concept defined in the text of the patent as "copper ore"]

3. ((+COPPER+ OR +CUPROUS+ OR +CUPRIC+ OR +CUPRIT+ OR +CUPRUM+ OR CU))/TI/AB/CLMS AND (C22B)/IPC/CPC   [replace keyword "ore" for broad IPC/CPC code used for "ore"]

4. ((+COPPER+ OR +CUPROUS+ OR +CUPRIC+ OR +CUPRIT+ OR +CUPRUM+ OR CU))/DESC/ODS AND (C22B)/IPC/CPC   [see remark query line 2]

5. (C22B)/IPC/CPC   [broad IPC/CPC code for "ore"]

6. (CHALCOCITE+ OR COVELLITE+ OR CHALCOPYRITE+ OR BORNITE+ OR ENARGITE+ OR TETRAHEDRITE+ OR CUPRITE+ OR TENORITE+ OR MALACHITE+ OR AZURITE+ OR CHALCANTHITE+ OR BROCHANTITE+ OR CHRYSOCOLLA+)/TI/AB/CLMS   [extend "copper ore" concept]

7. (CHALCOCITE+ OR COVELLITE+ OR CHALCOPYRITE+ OR BORNITE+ OR ENARGITE+ OR TETRAHEDRITE+ OR CUPRITE+ OR TENORITE+ OR MALACHITE+ OR AZURITE+ OR CHALCANTHITE+ OR BROCHANTITE+ OR CHRYSOCOLLA+)/DESC/ODES   [see remark query line 2]

8. (CUS OR CU2S OR CU9S5 OR CUFES2 OR CU3SBS3)/TI/AB/CLMS   [extend "copper ore" concept]

9. (CUS OR CU2S OR CU9S5 OR CUFES2 OR CU3SBS3)/DESC/ODES   [see remark query line 2]

10. (((MICRO_ORG+ OR BACTER+ OR BACIL+) S (+SULF+ OR +SULPH+ OR THIO+ OR +THIOL+ OR +MERCAPT+)) OR SOB)/TI/AB/CLMS   [underscore_; will retrieve terms that may be written as one or two words, and will retrieve results where there is a hyphen between terms]

11. (((MICRO_ORG+ OR BACTER+ OR BACIL+) S (+SULF+ OR +SULPH+ OR THIO+ OR +THIOL+ OR +MERCAPT+)) OR SOB)/DESC/ODES   [see remark query line 2]

12. (+THIO_BACILL+ OR +MERCAPT+_BACILL+)/TI/AB/CLMS

13. (+THIO_BACILL+ OR +MERCAPT+_BACILL+)/DESC/ODES   [see remark query line 2]

14. (C12N OR C12R)/IPC/CPC   [broad IPC/CPC code for "microorganism"]

15. (DE OR FR OR GB)/PN/DS

16. (1 OR 3 OR 6 OR 8) AND (10 OR 12) AND 15

17. (1 OR 3 OR 6 OR 8) AND (11 OR 13) AND 15

18. (2 OR 4 OR 7 OR 9) AND (10 OR 12) AND 15

19. (2 OR 4 OR 7 OR 9) AND (11 OR 13) AND 15

20. 5 AND 10:13 AND 15

21. 1:4 AND 14 AND 15

22. 5 AND 14 AND 14

Query lines 16-22 can be limited in time (see remark above query line 9-14)