# TSCA Chemical Data Reporting Fact Sheet: Reporting Manufactured Chemical Substances from Metal Mining and Related Activities

This fact sheet provides guidance on the Chemical Data Reporting (CDR) rule requirements related to the reporting of mined metals, intermediates, and byproducts manufactured during metal mining and related activities. This fact sheet supplements other documents, such as the 2016 CDR Instructions for Reporting.

The primary goal of this document is to help the regulated community comply with the CDR rule. This document does not substitute for that rule, nor is it a rule itself. It does not impose legally binding requirements on the regulated community or on the U.S. Environmental Protection Agency (EPA).

The CDR rule, issued under the Toxic Substances Control Act (TSCA), requires manufacturers (including importers) to give EPA information on the chemicals they manufacture domestically or import into the United States. EPA uses the data, which provides important screening-level exposure related information, to help assess the potential human health and environmental effects of these chemicals and makes the non-confidential business information it receives available to the public.

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## Mining Activities and Manufacturing under the CDR Rule

Reporting under the CDR rule is based on the manufacture (including import) of chemical substances (see 40 CFR 711.8). Mining is a manufacturing activity, and as such is captured by the definition of manufacturing.

It is important to note that the act of processing or using one chemical substance (including a naturally occurring chemical substance) may result in the manufacture of a reportable chemical substance. In such cases, persons who process or use chemical substances may be subject to reporting requirements under CDR: not with respect to the chemical substance that they processed or used, but with respect to the chemical substance *that they manufactured*.

### 1. When is a mined material exempt from reporting under the CDR rule?

This section describes when your mined chemical substance is not reportable. Table 1 provides a brief summary.

*Manufactured for commercial purposes*

If the materials resulted from mining activities that have no commercial purpose, then the manufacture of those materials is not reportable under the CDR rule. That is because, for a chemical substance to be reportable under the CDR rule, it must be manufactured for commercial purposes. “Manufactured for commercial purposes” means:

> (1) To import, produce, or manufacture with the purpose of obtaining an immediate or eventual commercial advantage for the manufacturer, and includes among other things, such “manufacture” of any amount of a chemical substance or mixture (i) For

commercial distribution, including for test marketing; and (ii) For use by the manufacturer, including use for product research and development, or as an intermediate.

(2) Manufacture for commercial purposes also applies to substances that are produced coincidentally during the manufacture, processing, use, or disposal of another substance or mixture, including both byproducts that are separated from that other substance or mixture and impurities that remain in that substance or mixture. Such byproducts and impurities may, or may not, in themselves have commercial value. They are nonetheless produced for the purpose of obtaining a commercial advantage since they are part of the manufacture of a chemical product for a commercial purpose. (40 CFR 704.3, referenced by 40 CFR 711.3)

**Table 1: Overview of when Substances Resulting from Mining Activities are not Reportable under CDR**

| You do **not** report a chemical substance under CDR when your chemical substance is: | Regulatory Citation | Cautions |
|---|---|---|
| Not manufactured for a commercial purpose | 40 CFR 704.3, referenced by 40 CFR 711.3 | • Mined materials are typically manufactured for a commercial purpose. |
| A byproduct manufactured for a commercial purpose, but not used for a commercial purpose after it is manufactured. | 40 CFR 704.3, referenced by 40 CFR 711.3 and 40 CFR 720.30 (g) and (h)(2), referenced by 40 CFR 711.10(c) | • Byproduct chemical substances are typically manufactured for a commercial purpose, and are reportable when they are also used for a non-exempt commercial purpose. |
| A naturally occurring chemical substance as defined for TSCA purposes | 40 CFR 711.6(a)(3) | • A naturally occurring chemical substance is exempted from reporting as long as it meets the TSCA definition of “naturally occurring chemical substance” at 40 CFR 710.4(b)<br>• As a result of processing, a naturally occurring substance may no longer be considered a naturally occurring chemical substance under TSCA and would be subject to reporting under CDR. |

*Naturally occurring chemical substances*

The manufacture of a naturally occurring chemical substance as described in 40 CFR 710.4(b) is exempt from CDR requirements. (40 CFR 711.6(a)(3))

A chemical substance qualifies as naturally occurring if it is:

(1)(i) Unprocessed or (ii) Processed only by manual, mechanical, or gravitational means; by dissolution in water; by flotation; or by heating solely to remove water; or

(2) Extracted from air by any means. (40 CFR 710.4(b), referenced by 40 CFR 711.3)

Mined materials such as metal ores, minerals, and clays that are separated from the natural environment by only physical means are examples of chemical substances that are considered naturally occurring for TSCA purposes and are exempt from reporting under the CDR rule.

**2. When is a mined material no longer a naturally occurring chemical substance?**

When a naturally occurring substance is further processed in any manner other than as specifically described above in the definition for naturally occurring chemical substances (see the previous section), it is no longer considered a naturally occurring chemical substance as defined in 40 CFR 710.4(b) and, therefore, would not be exempt from reporting under the CDR rule. In many instances, processes involved in extractive metallurgy, for example, would make the mined material no longer a naturally occurring chemical substance.

For example, if Company A manufactures bauxite ore such that the bauxite ore meets requirements to be considered a naturally occurring chemical substance for purposes of CDR, and then further processes the bauxite ore through chemical flocculation to concentrate the ore, then Company A's manufacture of the concentrated bauxite ore is not the manufacture of a "naturally occurring chemical substance." Company A's manufacture of concentrated bauxite ore through chemical flocculation is not thereby exempt from reporting under the CDR rule.

In another example, Company A manufactures and processes copper ore in such a way that the copper ore is considered a naturally occurring chemical substance for purposes of CDR. Company A is exempt from reporting the copper ore under the CDR rule. Company A then sells the copper ore to Company B who uses hydrometallurgical processes to recover elemental copper from the ore. The elemental copper is a wholly separate chemical substance from the copper ore, and the manufacture of the elemental copper is furthermore not the manufacture of a "naturally occurring chemical substance." The copper is not covered under the exemption and Company B must report the manufacture of copper.

## Intermediates and Byproducts under the CDR Rule

Reporting under the CDR rule may also extend to chemical intermediates and byproducts that are manufactured in the course of mining activities. This section discusses the reporting requirements under the CDR rule for intermediates and byproducts generated during these activities. Table 2 identifies examples of intermediates and byproducts from several mining activities.

**1. When is an intermediate reportable?**

An intermediate is reportable if it is produced in sufficient quantity and neither the naturally occurring chemical substance exemption nor any other exemption applies to its manufacture.

An intermediate is defined by regulation:

> *Intermediate* means any chemical substance that is consumed, in whole or in part, in chemical reactions used for the intentional manufacture of other chemical substances or mixtures, or that is intentionally present for the purpose of altering the rates of such chemical reactions. (40 CFR 704.3, referenced by 40 CFR 711.3)

Even if an intermediate no longer qualifies for the naturally occurring chemical substances exemption, it may qualify for the "non-isolated intermediate" exemption. See 40 CFR 711.10(c), 40 CFR 720.30(h)(8)). A non-isolated intermediate is defined by regulation:

> *Non-isolated intermediate* means any intermediate that is not intentionally removed from the equipment in which it is manufactured, including the reaction vessel in which it is manufactured, equipment which is ancillary to the reaction vessel, and any equipment through which the substance passes during a continuous flow process, but not including tanks or other vessels in which the substance is stored after its manufacture. Mechanical or gravity transfer through a closed system is not considered to be intentional removal, but storage or transfer to shipping containers "isolates" the substance by removing it from process equipment in which it is manufactured. (40 CFR 704.3, referenced by 40 CFR 711.3)

For additional information about non-isolated intermediates, see *TSCA Chemical Data Reporting Fact Sheet: Non-Isolated Intermediates*.

**2. When is a byproduct reportable?**

As a mined material is further processed, it is also possible that byproducts are manufactured as a result of the use of various chemicals to extract metals or other valuable materials. Because the manufacture of the byproduct is coincidental to some other activity by which the manufacturer is obtaining a commercial advantage, the byproduct is manufactured for a commercial purpose. Like other chemical substances manufactured for commercial purposes, byproducts are subject to reporting unless an exemption applies.

The manufacture of a byproduct is exempt from reporting if the byproduct is not "used for commercial purposes." (40 CFR 720.30(h)(2), referenced by 40 CFR 711.10(c))

The manufacture of a byproduct is also exempt from reporting if its only commercial purpose is for use by public or private organizations that

> (1) Burn it as a fuel,
> (2) Dispose of it as a waste, including in a landfill or for enriching soil, or
> (3) Extract component chemical substances from it for commercial purposes. This exclusion only applies to the byproduct; it does not apply to the component substances extracted from the byproduct. (40 CFR 720.30(g), referenced by 40 CFR 711.10(c))

## Determining the Reporting Threshold

To determine whether a chemical substance meets the reporting threshold for CDR, compare the applicable reporting threshold to the total amount of that chemical substance produced at the whole site (40 CFR 711.15). For example, if there are three processes on a site, and each process produces 10,000 pounds of Chemical X at the site in a single year, then the 25,000 pounds reporting threshold is exceeded for Chemical X at the site.

For some of the processes used in mining and extraction activities, Table 2 gives examples of chemical substances manufactured from these processes and which may be considered reportable under the CDR rule. Each company should evaluate the chemical substances manufactured in each of its processes and determine if each chemical substance would be subject to CDR reporting requirements.

**Table 2: 2016 CDR Reporting Requirements for Select Examples of Mining Activities**

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| **Mining** | | | |
| Mining (surface or underground) | Remove metals and minerals contained in other geological materials in the natural environment, such as rocks, ores, reefs, and seams. | Mined material (rocks, ores, etc.) | **Not Reportable**, if the mined material meets the definition of naturally occurring chemical substance.<br><br>**Reportable,** if the mined material does not meet the definition of naturally occurring chemical substance (40 CFR 710.4(b)). |
| **Mineral Processing** | | | |
| Size reduction (i.e., comminution) | Reduce by physical means the size of mined material to liberate metals and minerals from gangue and prepare them for further processing | None | **Not reportable**. This is a mechanical process in which the chemical identity of the ore does not change and no chemical substances were manufactured.<br><br>e.g. crushing and grinding of mined ore |
| Sizing | Separate mined ore to ensure it meets size requirements before further processing | None | **Not reportable**. This is a mechanical process in which the chemical identity of the ore does not change and no chemical substances were manufactured.<br><br>e.g., screening, sieving or classification of mined ore |
| Concentration | Separate valuable metals and minerals into a small, concentrated mass which can be treated further to produce purer forms of metal or mineral products | Metal or mineral complexes | **Reportable**, if the concentration of the wanted minerals entails methods that are inconsistent with the naturally occurring status of the starting materials (e.g., concentration by chemical means).<br><br>e.g., flocculation, agglomeration |
| | | None | **Not reportable**, if the concentration of the wanted materials uses only physical methods, retaining the naturally occurring status of the starting |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | | materials, as described in 40 CFR 710.4(b).<br><br>e.g. gravity separation, gravity concentration, froth flotation, optical and photometric sorters |
| Dewatering | Remove water from mineral slurries to prepare the material for further processing | None | **Not reportable**, because this is a mechanical or gravitational process in which the chemical identity of the ore does not change (even through heating to remove water) and no chemical substances were manufactured.<br><br>e.g. sedimentation, filtration, centrifugal separation and thermal drying |
| **Extractive Metallurgy** | | | |
| **Hydrometallurgy:** extraction of metals from ores by treating them with aqueous chemical solutions, including extraction by electrolysis and ion exchange | | | |
| Leaching | Dissolve the mined material and separate the valuable metals and minerals from the gangue material<br><br>e.g. in-situ, heap, vat, tank, or autoclave leaching | Soluble metal or mineral salts in aqueous or other solution(s) | **Reportable**, if leaching occurs in any solution other than plain water, such as with other solvents, solutions, or liquid chemicals.<br><br>e.g., leaching by acid solutions, alkaline solutions, complex-forming solutions, oxidizing solutions, other solvent/chemical solutions, and/or bioleaching |
| | | | **Not reportable**, because exempt as a naturally occurring chemical substance, if leaching of mined material that itself qualifies as a naturally occurring chemical substance occurs solely by dissolution in water |
| | | Solid spent ore (gangue) | **Reportable**, if spent ore is not a naturally occurring chemical substance and is used as is for a non-exempt commercial purpose or for secondary processing and recovery of additional metals and minerals using chemical methods. |
| | | | **Not reportable**,<br>(1) if spent ore is a naturally occurring chemical substance because the |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | | processing used to generate the spent ore used only physical means allowed under 40 CFR 710.4(b), or<br>(2) if spent ore is not a naturally occurring chemical substance and, as a byproduct, it is disposed of as a waste or used for another exempt use listed in 40 CFR 720.30(g), such as to extract a component chemical substance. |
| Purification and concentration | Remove impurities and/or concentrate the solution containing valuable metals and minerals<br><br>e.g., precipitation, distillation, adsorption, cementation, gas reduction, ion exchange, solvent extraction, electrowinning | Metal byproducts | **Reportable**, if the impurity is removed from solution via chemical methods that produce a byproduct and is used for a non-exempt commercial purpose.<br><br>e.g. precipitation of copper as copper sulfide as a means to purify nickel leachates and the subsequent recovery of copper from copper sulfide |
| | | | **Not reportable**,<br>(1) if the impurity is a naturally occurring chemical substance because the material that is being purified or concentrated is a naturally occurring chemical substance and the process used to remove the impurities used only physical means allowed under 40 CFR 710.4(b), or<br>(2) if the impurity is not a naturally occurring chemical substance and, as a byproduct, it is disposed of as a waste or used for another exempt use listed in 40 CFR 720.30(g), such as to extract a component chemical substance. |
| Recovery or precipitation | Recover metal or its compound from solution<br><br>e.g., precipitation, cementation, electrolysis | Recovered metal solids | **Reportable**, if the metal or its compound is produced via chemical methods.<br><br>e.g., gold electrowinning in precious metals recovery; iron displacement to recover copper. |
| | | | **Not reportable**,<br>(1) if the recovered metal solids is a naturally occurring chemical substance because the material |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | | from which it is recovered is a naturally occurring chemical substance and the process used for recovery used only physical means allowed under 40 CFR 710.4(b), or<br>(2) if the recovered metal solids is not a naturally occurring chemical substance and, as a byproduct, it is disposed of as a waste or used for another exempt use listed in 40 CFR 720.30(g), such as to extract a component chemical substance. |
| | | Spent leachate solution | **Reportable**, if spent leachate solution is not a naturally occurring chemical substance and, as a byproduct, is further processed to recover materials for commercial purposes. |
| | | | **Not reportable**,<br>(1) if the spent leachate solution is a naturally occurring chemical substance, or<br>(2) if the spent leachate solution is not a naturally occurring chemical substance and, as a byproduct, it is disposed of as a waste or used for another exempt use listed in 40 CFR 720.30(g), such as to extract a component chemical substance. |
| **Pyrometallurgy:** high temperature processes involving chemical reactions among gases, solids, and molten materials | | | |
| Ore/concentrate preparation | Alters the chemical and physical properties of the ore/concentrate to make it more suitable for further processing<br><br>e.g., calcination, roasting of sulfides, chlorination, sintering and pelletizing | Metal oxides, metal sulfates, metal chlorides, and metal agglomerations | **Reportable**, if the process occurs separately from smelting and the resulting product is either intentionally removed from the operating unit and considered an “isolated chemical intermediate” or is further processed.<br><br>e.g., metal agglomeration from pelletizing is removed from the processing unit and stored prior to being fed to the smelting process; calcine is formed by the calcination of dolomite and then is shipped elsewhere for final processing into magnesium metal. |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | | **Not reportable**, if the process occurs in the same operating unit as smelting and if the substance is not intentionally removed from that process equipment prior to final processing; therefore the resulting product may be a "non-isolated chemical intermediate" and exempt from reporting.<br><br>e.g., calcination of limestone occurring within the smelting furnace shaft and is then converted to slag in the lower part of the furnace |
| Smelting | Uses heat and a chemical reducing agent to remove metals impurities from ore and create final metal products<br><br>e.g., reduction smelting of non-ferrous metals, matte smelting and converting, reduction to gaseous metal and reduction to solid metal | Elemental Metal(s) (one metal element or a combination of them) | **Reportable**, if the metal (whether a single metal, a metal mixture or a UVCB chemical substance) is on the TSCA Inventory and manufactured for a non-exempt commercial purpose, including use of a metallic UVCB substance in secondary processing to recover individual metals and minerals by chemical methods.<br><br>e.g., bars of dore, which contain silver and gold (the UVCB substance CASRN 69029-47-6); gold (CASRN 7440-57-5), copper (CASRN 7440-50-8), tin (CASRN 7440-31-5), nickel (CASRN 7440-02-0) |
| | | | **Not reportable**, if the metal has been reported in a previous step and the smelting process is simply removing impurities from the metal. |
| | | Slag | **Reportable**, if the slag, which is a byproduct chemical substance, is used for a commercial purpose, such as to manufacture another chemical substance.<br><br>e.g., slags, dore furnace (CASRN 67711-98-2); slags, copper smelting (CASRN 67711-92-6) |
| | | | **Not reportable**, if the slag, as a byproduct, is disposed of as waste orr |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | | used for another exempt use listed in 40 CFR 720.30(g),. |
| Refining | Removal of metal impurities from molten metal to refine final product | Precipitated metal byproducts | **Reportable**, if the precipitated metal byproducts are further processed to recover metals for a commercial purpose. See the discussion under "not reportable."<br><br>e.g. removal of iron from tin via drossing; removing residual copper from crude lead by adding sulfur to precipitate $Cu_2S$. |
| | | | **Not reportable**, if the precipitated metal impurities, as a byproduct, is disposed of as waste or used for another exempt use listed in 40 CFR 720.30(g),, such as extracting a component chemical substance. |
| **Electrometallurgy:** processes taking place in an electrolytic cell | | | |
| Purification and concentration via electrochemical methods | Recovers metal by electrochemical reduction of metal compound in an electrolyte solution and subsequent plating of the metal onto a cathode.<br><br>e.g., electrowinning from aqueous solutions, fused salt electrolysis | Elemental metal – almost pure | **Reportable**, if the chemical is manufactured for commercial purposes, it is not a byproduct, it is not a non-isolated intermediate, and it is not a naturally occurring substance. If it is a byproduct that is used for a non-exempt commercial purpose, it would also be reportable.<br><br>e.g., copper (CASRN 7440-50-8); zinc (CASRN 7440-66-6) |
| | | Spent electrolyte | **Reportable**, if the spent electrolyte is further processed to recover metals. The spent electrolyte solution and any materials recovered from the spent electrolyte solution are reportable. |
| | | | **Not reportable,** if the spent electrolyte is a byproduct that is disposed of as a waste, or used for another exempt use listed in 40 CFR 720.30(g),. |

| Mining Activity | Description of Activity | Types of Chemical Substances Manufactured | 2016 CDR Reporting Requirement and Select Examples |
|---|---|---|---|
| | | Sludge from the bottom of electrowinning tanks | **Reportable**, if the chemical substance is a byproduct UVCB substance, listed on the TSCA Inventory and manufactured and used for a commercial purpose.<br><br>e.g., slimes and sludge, copper electrolytic (CASRN 67711-95-9) |
| | | | **Not reportable**, if the sludge, as a byproduct, is disposed of as waste or used for another exempt use listed in 40 CFR 720.30(g),. |
| Electrorefining | Purification process in which an impure metal anode from smelting is dissolved in a solution of a salt of the desired metal product and then recovered to produce high purity cathode | Elemental metal – almost pure | **Reportable**, if the chemical is manufactured for commercial purposes, it is not a byproduct used only for exempted uses, it is not a non-isolated intermediate, and it is not a naturally occurring substance.<br><br>e.g., copper (CASRN 7440-50-8); nickel (CASRN 7440-02-0) |
| | | Spent electrolyte | **Reportable**, if the spent electrolyte is further processed to recover metals |
| | | | **Not reportable**, if the spent electrolyte, as a byproduct, is disposed of as waste or used for another exempt use listed in 40 CFR 720.30(g),. |
| | | Sludge from the bottom of electrowinning tanks | **Reportable**, if this is a byproduct UVCB substance on the TSCA Inventory and manufactured for a non-exempt commercial purpose.<br><br>e.g., slimes and sludge, copper electrolytic (CASRN 67711-95-9) |
| | | | **Not reportable.** The sludge, as a byproduct, is disposed of as waste or used for another exempt use listed in 40 CFR 720.30(g),. |

**Scenario – Gold Recovery from Ore**

This example provides an overview of a gold (Au) recovery process that results in manufactured chemicals, intermediates, and byproducts that may be reportable to CDR. The prevalent method for the recovery of gold from mined ore uses Carbon-in-Pulp (CIP) or Carbon-in-Leach (CIL) processes. The major difference between CIP and CIL is that, in CIP, leaching and carbon adsorption occur sequentially and in CIL, leaching and carbon adsorption occur simultaneously. The following section details a CIP process.

See Figure 1 for a simplified schematic of the mineral processing and extractive metallurgy activities involved with the Carbon-in-Pulp gold recovery process.

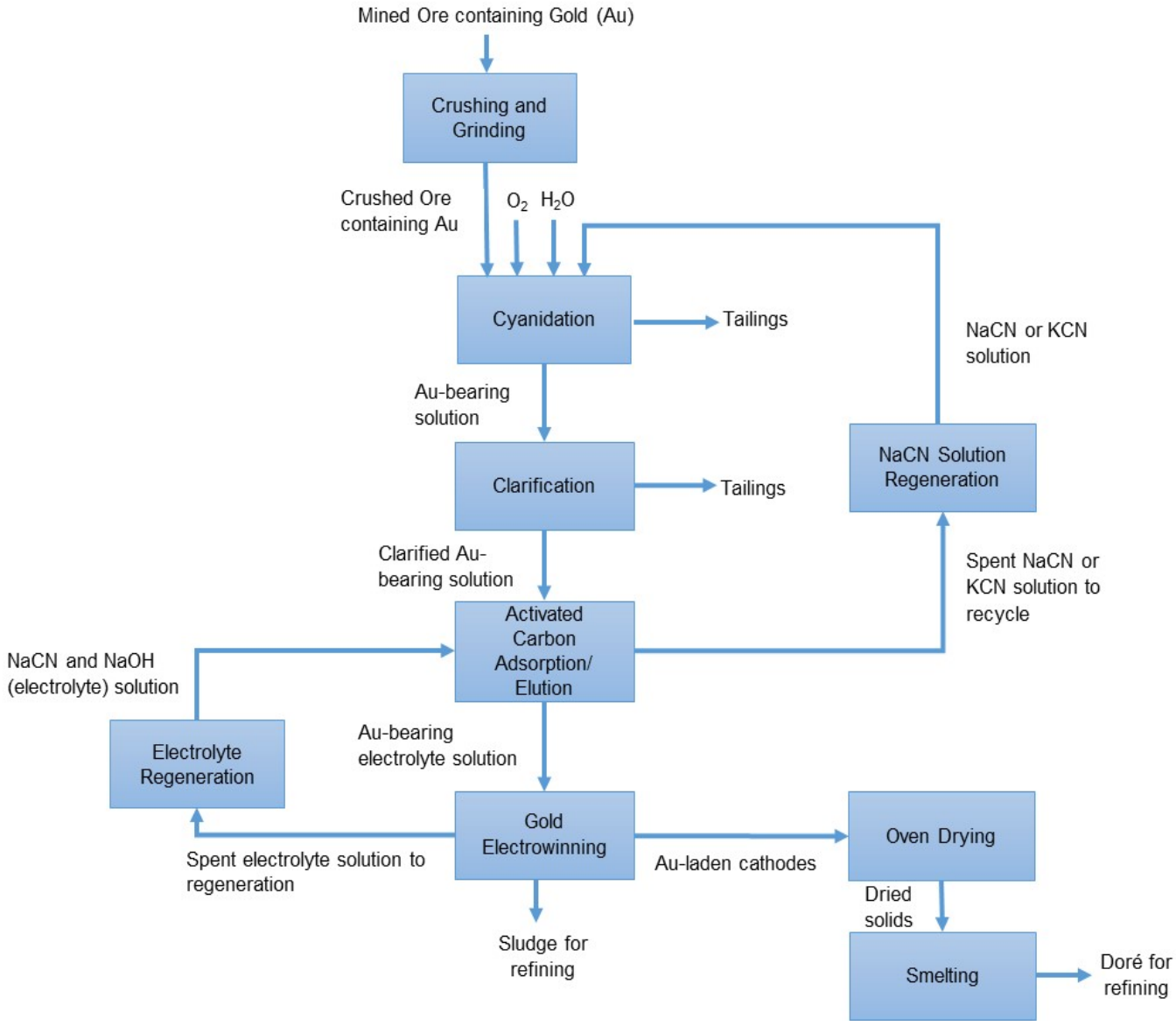


**Figure 1: Carbon-in-Pulp Gold Recovery Process**

## PROCESS OVERVIEW:

In CIP, the mined ore first undergoes a leaching process (via milling or oxide milling) using a sodium or potassium cyanide solution (i.e., cyanidation) followed by a concentration step. Concentration involves adsorption of the gold by activated carbon followed by elution using a sodium or potassium cyanide and sodium hydroxide solution. The eluate undergoes gold electrowinning, where an electric current is applied to facilitate precipitation (plating) of gold from the eluate onto a cathode (usually steel wool). The plated gold is washed off of the cathode and oven dried. The dried gold is then further purified via smelting methods. Some impurities may remain on the activated carbon after elution. These impurities are generally burned off in a carbon regeneration furnace.

*Crushing and Grinding*

**Is the mined ore reportable under CDR?**

Mined ore containing gold (Au) is prepared for extraction through crushing and grinding, and also may be further treated to remove sulfur.

- The mined ore is a naturally occurring chemical substance and therefore is not reportable under CDR. (40 CFR 711.6(a)(3))
- The crushing and grinding processing steps to prepare the ore for extraction are all mechanical and do not change the naturally occurring status of the mined material.
- Some crushed ore may also be roasted or autoclaved for sulfur removal, which produces sulfide or sulfate byproducts that are reportable under CDR, unless otherwise exempt (see byproduct exemptions at 40 CFR 720.30(g), referenced by 40 CFR 711.10(c)).

*Cyanidation*

**Does the Cyanidation process result in reportable chemical substances?**

In milling or oxide milling, the ground ore is mixed with an aqueous solution of sodium cyanide or potassium cyanide (NaCN or KCN), which, in the presence of air or pure oxygen, leaches the gold from the crushed ore resulting in an Au-bearing solution (i.e., a NaCN or KCN solution) and tailings. This Au-bearing solution is then separated from the tailings via clarification. The tailings are sent for disposal and the Au-bearing solution is further processed to purify and/or concentrate the gold.

- The tailings are not reportable to CDR because they are byproducts that are disposed of as waste, which makes them exempt from CDR reporting. (40 CFR 720.30(g), referenced by 40 CFR 711.10(c))
- The Au-bearing solution is a chemical intermediate manufactured during the cyanidation process and is generally reportable unless it meets the definition of “non-isolated intermediate” (defined in 40 CFR 704.3).

*Activated Carbon Adsorption/Elution*

**Does the adsorption step result in reportable chemical substances?**

After clarification, the Au-bearing solution is exposed to granulated activated carbon which adsorbs the metal (primarily gold and mercury, but also silver, copper and other related compounds). After adsorption, the remaining spent NaCN or KCN solution (known in industry as

the gold-barren leach solution) is 1) chemically treated/neutralized and disposed of as waste or 2) regenerated to be reused in the cyanidation process.

- Spent NaCN or KCN solution: The spent NaCN or KCN solution is likely characterized as a chemical substance that is of Unknown or Variable composition, a Complex reaction product or a Biological material (a "UVCB" chemical substance) that is reportable for purposes of CDR.
    - The recovery of the sodium cyanide or potassium cyanide in aqueous solution (or any other chemical component) from a UVCB substance for reuse is considered to be manufacturing and therefore, is also reportable for purposes of CDR.
    - If the spent solution is disposed of as waste, it is not reportable for purposes of CDR because it is an exempt byproduct.
- The metal compounds adsorbed onto the activated carbon are reportable unless they meet the definition of a "non-isolated chemical intermediate."

**Does the elution step result in reportable chemical substances?**

An elution process removes adsorbed gold, mercury and related compounds from the activated carbon bed using a solution of sodium or potassium cyanide and sodium hydroxide resulting in an Au-bearing electrolyte solution (i.e., an electrolyte solution containing gold, mercury and other trace metals, known in industry as a pregnant strip solution). After elution, the activated carbon (containing some impurities) is regenerated in a carbon regeneration furnace which burns the impurities off.

- The Au-bearing electrolyte solution is likely characterized as a UVCB substance and is generally reportable unless it meets the definition of "non-isolated chemical intermediate."
- The regenerated carbon is not reportable under CDR because it has not undergone any change in chemical identity.
- The impurities are disposed of as waste when they are burnt off of the activated carbon and are thus not reportable under CDR, as they are exempt byproducts.

*Gold Electrowinning*

**Does the electrowinning process result in reportable chemical substances?**

The Au-bearing electrolyte solution undergoes gold electrowinning, an electrolytic redox reaction, to recover the gold in solution. In gold electrowinning, the Au-bearing electrolyte solution passes through an electrolytic cell containing a set of cathodes and anodes. A rectifier passes an electrical current through the cell that causes the gold ions to be reduced and deposited onto the cathode. The remaining spent electrolyte solution (i.e., spent electrolyte consisting of cyanide, hydroxide and other metal ions, known in industry as barren strip solution) is either disposed of, regenerated and reused, or further processed to recover additional metal products.

- If the spent electrolyte is disposed of, it is classified as an exempt byproduct and is not reportable.
- If the spent electrolyte is further processed to recover additional metal products, the solution and any metals recovered from the solution are considered to be manufactured substances and are reportable for purposes of CDR unless otherwise exempt.

During electrowinning, a sludge forms at the bottom of the reaction tank, consisting of metal compounds that have not been deposited on the cathode. Generally, the sludge is further processed via pyrometallurgy techniques (i.e., smelting) to recover the valuable components of the sludge.

- This sludge is a byproduct that is likely classified as a UVCB substance and, if so, the sludge and any chemical substances recovered from it are reportable for purposes of CDR.
- If the recovered chemical substances are extracted from the sludge as component chemical substances (already existing in the sludge), the extracted substances are reportable and the UVCB substances is exempted from reporting. ((40 CFR 720.30(g), referenced by 40 CFR 711.10(c))

*Oven Drying and Smelting*

**Does the oven drying and doré formation process result in reportable chemical substances?**

After electrolysis, the gold and other solids are washed off the cathodes and oven dried. The dried solids are then smelted into doré (i.e., bars or bullions that contain both silver and gold) before being sent off-site for further refining.

- The resultant doré may be a UVCB substance or a mixture of metals (i.e. an alloy of known composition).
  - If the resultant doré is characterized as a mixture of metals, the mixture itself is not reportable for purposes of CDR, however each component metal is reportable for purposes of CDR.
  - If the resultant doré is characterized as a UVCB substance, the doré is reportable under CDR because it is manufactured for a commercial purpose and is listed on the TSCA Inventory (CASRN 69029-47-6).

*Doré Refining*

**Does refining of the doré result in reportable chemical substances?**

Doré is smelted at mining sites and sent off-site to be further purified via specialty smelting methods. Smelting removes impurities from the doré to produce a purer form of gold. In smelting, the doré is exposed to high temperatures and the chemical compounds in the doré (mostly oxides of gold, silver, and copper) are exposed to reducing agents that free the metals from the molten material (to become molten metals). Flux is also added to catalyze the redox reactions as well as to provide a binding agent to unwanted impurities and reaction products, contributing to the production of molten slag.

- Slag produced during smelting is also classified as a UVCB substance on the TSCA Inventory (CASRN 67711-98-2). Slag may be sold for recovery of its component metals.
  - If the recovery of the metals involves a chemical reaction that results in a chemical substance that is not a component chemical substance, the slag is considered a byproduct used for a non-exempt commercial purpose and is thus reportable to CDR.

  - If the recovery of the metals does not require a chemical reaction to extract the component metals, or if the only portions of the slag that are reacted are disposed of as a waste, then the slag's only commercial purpose is "for use to extract component chemical substances from it for commercial purposes" and is therefore an exempt byproduct, not reportable for purposes of CDR.
  - Slag may also be disposed of as waste, in which case it is not reportable for purposes of CDR because it is an exempt byproduct.
- Slag may contain residual gold, and therefore is often sent back through the smelting process to recover the additional gold. Because the slag is classified as a UVCB substance, the slag and any chemical substance recovered from it via chemical reaction are reportable for purposes of CDR.
- The "pure" gold recovered from doré or slag in the smelting process is considered "manufactured for a non-exempt commercial purpose" and is reportable for purposes of CDR.

## For further information:

To access copies of additional fact sheets and other CDR information, log onto www.epa.gov/cdr.

If you have questions about CDR, you can contact the TSCA Hotline by phone at 202-554-1404 or e-mail your question to eCDRweb@epa.gov.