DRAFT TANZANIA STANDARD

TBS/MMDC 9 (339) P2: *Mineral Processing Terminology - Part 5: Mine effluent detoxification*

TANZANIA BUREAU OF STANDARDS

 first edition

0 Foreword

This draft Tanzania Standard is being prepared by the Mineral Processing and Equipment Technical Committee (MMDC 9), under the supervision of the Mining and Minerals Standards Divisional Committee (MMDC).

This document has been prepared in order to standardize and co-ordinate technical terms in current use in the mining industry and ensure expertise of other type of mining activities.

The need for this document arose from the widely varying interpretation of terms used within the industry

In preparation of this draft Tanzania Standard assistance was derived from 911metallurgist website ,and Dictionary of Mining, Mineral, and Related Terms in Mineral Processing (Hacettepe University Department of Mining Engineering)

This draft Tanzania Standard is the part of the general title of Mineral Processing Terminology which consists of the following parts, -

Part 1: Comminution

Part 2: Concentration

Part 3: Metal recovery processes

Part 4: Metallurgical accounting

Part 5: Mine effluent detoxifications

1 Scope

This document specifies the commonly used terms in mineral processing, only terms which have a specific meaning in this field have been included in Mine effluent detoxifications

2 Normative references

This document does not contain normative references

3. Terms and definitions

3.1 Acidic drainage

acidic water (and possibly water that contains metal(s)) resulting from the chemical weathering of rock or soil material primarily caused by the oxidation of sulphide minerals. Also referred to as acid mine drainage (AMD) or acid rock drainage (ARD)

3.2 Acidothiobaccilus ferrooxidans

bacteria used for sulfide-mineral oxidation

3.3 Activated carbon polishing

process of using activated carbon to remove cyanide to low levels when the initial cyanide concentration is already below 5 mg/L

3.4 Aerobic (oxic) process

process whereby cyanide, thiocyanate, nitrite and ammonia are oxidized to nitrate

3.5 Alkaline chlorination process

process whereby the cyanide destruction reaction occurs in two – steps; the first which cyanide is converted to cyanogen chloride (CNCl) and the second cyanogen chloride hydrolyses to yield cyanate

3.6 Anaerobic (anoxic) process

process whereby nitrate and nitrite are removed as nitrogen gas

3.7 Breakpoint chlorination

process whereby the chlorination can easily be configured to complete the oxidation of ammonia into nitrogen gas

3.8 Caro's acid

reagent produced by reacting concentrated hydrogen peroxide (70%) and sulfuric acid (93%) in a controlled temperature environment in the proportion of 1:2.5

3.9 Caro's acid process

cyanide detoxification process which uses Caro's acid to convert free cyanide to cyanate which is a less toxic compound

3.10 Cyanide treatment

destruction process which involves chemical or biological reactions to convert cyanide into another less toxic compound, usually cyanate

3.11 Coal refuse

the reject material (slate, shale, sandstone, siltstone, and clay minerals) that is produced during the preparation and washing of coal

3.12 Contained effluents

effluents stored on site with little or no release to the environment

3.13 Contaminant

any physical, chemical or biological substance that is introduced into the environment. Does not imply an effect. Usually refers to substances of anthropogenic origin

3.14 Contamination

action of introducing hazardous substances (or excessive amounts of substances not usually hazardous) to the environment, causing negative environmental impacts

3.15 Degradation

reduction or loss of overall environmental quality, or of one environmental component (e.g. water quality)

3.16 Detoxification

process which is used to reduce the concentration of toxic constituents in tailings stream, either by dilution, removal or conversion to less toxic chemical form

3.17 Direct solution recycles

this is when the solution is returned directly from the tailings stream to the process

3.18 Dry tailings disposal

method for the disposal of tailings in which tailings are first dewatered and then disposed on land as paste in a landfill or backfill

3.19 Free cyanide

unreacted cyanide (CN^- or HCN) in solution

3.20 Effluents

complex waste material that is a by-product of human activity (i.e., liquid industrial discharge or sewage) and is discharged to the environment

3.21 INCO sulphur process

cyanide detoxification process that uses Sulphur dioxide and oxygen under copper(Cu^{2+}) as a catalyst.

3.22 Gaseous pollutants

all pollutants related to pyro metallurgical processes which may affect air quality within and around the project site and can have a secondary effect on water quality e.g. calcining, smelting, carbon activity, air purification from oxygen plant, oxide of nitrogen, heavy metals etc

3.23 Heavy metal

metallic elements with relatively high atomic weights (> 5.0 specific gravity) such as lead, cadmium, arsenic and mercury. Generally toxic in relatively low concentrations to plant and animal life

3.24 Kinetic testing

tests designed to determine the relative rates of acid generation and neutralization

3.25 Liquid

solution or slurries produced by the various hydrometallurgical processes e.g. cyanide leaching as well as the products of interaction between liquids, solids and gases waste associated with gold extraction technology

3.26 Iron - cyanide precipitation

occurs when Free, WAD and total cyanides react with ferrous iron to yield a variety of soluble and insoluble compounds, primarily hexacyanoferrate (III) ($Fe(CN)_6^{3-}$), Prussian blue ($Fe_4[Fe(CN)_6]^3$) and other insoluble metal-iron cyanide (MxFey(CN)6) compounds such as those of copper or zinc

3.27 Natural cyanide attenuation

natural decomposition of hydrogen cyanide through biological degradation, oxidation, volatilization, hydrolysis, photolysis and precipitation

3.28 Nitrification

process used to remove ammonia from cyanide detoxification processes. It involves biological mechanism of cyanate removal, first by oxidation of cyanate to ammonia, and then ammonia removal proceeds through a biological process

3.29 Nitrate treatment

process in which nitrate is converted to nitrogen gas

3.30 Oxygen

oxidizing agent in presence of soluble copper which act as a catalyst

3.31 Paste tailings

tailings slurry that does not segregate during mixing, transportation or placement and has a working consistency similar to wet concrete

3.32 Piezocone

device that is used with increasing frequency to investigate and facilitate characterization of in situ properties of deposited tailings

2.33 Strong Acid Dissociable (SAD) cyanide

strong metal cyanide complexes such as those of Au, Co, Fe^{2+}, Fe^{3+}, Pd and Pt

3.34 Solid

product with low moisture content (<10% water) obtained from extraction process which can cause possible contamination of surface ground water when contact with rainwater e.g. Acid mine drainage resulting from sulphide mineral decomposition, the release of residual cyanide and soluble metal species from leaching operation

3.35 Sodium Metabisulphate

source of sulphur dioxide used to destruct cyanide to less toxic form

3.36 Solution treatment

treatment of cyanide level in decant or process solution prior to being discharged into the environment

3.37 Tailings

waste material (mixture of water and solids) that contain extremely fine particles size (i.e. 40 to 90 percent passing a 0.075 mm) that are rejected from the grinding, screening, or processing of the ore

3.38 Tailings slurry treatment

removal or reduction of toxic constituents in the tailings materials before discharged or stored in the tailings storage facility

3.39 Tailings Storage Facility (TSF)

structure made up of (one or more dams) built for the purposes of storing the uneconomical ore (ground up rock, sand and silt) and water from the milling process or

low-lying depression used to confine tailings from the mine operation, the prime function which is to allow enough time for heavy metals to settle out or for cyanide to be destroyed before water is either recycled back into the mill operation or treated before discharge into the local watershed

3.40 Total cyanide

Combinations of all cyanide in tailings stream (free, WAD and SAD cyanides)

3.41 Thiocyanate

formed through the interaction of cyanide with sulfur- containing compounds, particularly sulfide minerals such as pyrrhotite [Fe(1-x) S], pyrite [FeS_2], chalcopyrite [$CuFeS_2$] or arsenopyrite [FeAsS]

3.42 Spent leached ore

hydrometallurgical wastes corresponding to leaching residues released at the end of the leaching process

3.43 Static testing

tests for short time prediction of the acid-generating potential of the tailings

3.44 Weak Acid Dissociable (WAD) cyanide

Weak and moderately strong metal-cyanide complexes of Ag, Cd, Cu, Hg, Ni and Zn

3.45 Wash Slimes

by-products of phosphate and aluminum production, generally contain significant amounts of water, even after prolonged periods of drying