DRAFT TANZANIA STANDARD

TBS/MMDC 9 (340) P2: *Terminology Relating to Activated Carbon*

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 mineral processing (leaching) and ensure expertise on minerals (precious metals) activities.

In preparation of this draft Tanzania Standard assistance was derived from **ASTM D2652 - 11(2020)** Standard Terminology Relating to Activated Carbon

1 Scope

This terminology covers terms particularly related to activated carbon and encompasses finished products, applications and testing procedures in the precious metals industry

Although this terminology is intended to promote uniformity in the usage of terms related to activated carbon, it can never be complete because new terms are constantly arising. The existence of this terminology does not preclude the use or misuse of any term in another context

2 Normative references

This document does not contain normative references

3Terms and definitions

3.1 Abrasion resistance

the property of a particle to resist attrition or wearing away by friction

3.2 Acid- extractable material

substances dissolved by an acid under specified conditions

3.3 Activated carbon

family of carbonaceous substances manufactured by processes that develop adsorptive properties

3.4 Activation

any process whereby a substance is treated to develop adsorptive properties

3.5 Activity

adsorptive capacity of an adsorbent

3.6 Adsorbate

any substance that is adsorbed

3.7 Adsorbent

any solid having the ability to concentrate significant quantities of other substances on its surface

3.8 Adsorption

process in which fluid molecules are concentrated on a surface by chemical or physical forces, or both

3.9 Adsorption zone/mass transfer zone

the region in which the concentration of the adsorbate of interest in the fluid decreases from influent concentration to the lowest detectable concentration

3.10 Ash

residue after the combustion of a substance under specified conditions

3.11 Channeling

the preferential flow of fluid through passages of lower resistance that can occur in fixed beds or columns of particles owing to non-uniform packing, irregular sizes and shapes of the particles, gas pockets, wall effects, and other causes

3.12 Co - adsorption

the adsorption of two or more components on an adsorbent, each affecting the adsorbability of the other

3.13 Contact batch operation

an adsorption process in which an adsorbent is dispersed in a fluid to be treated and then

separated when practical equilibrium is attained

3.14 Continuous moving bed

an adsorption process characterized by flow of a fluid through a bed of granular adsorbent with continuous withdrawal of spent adsorbent and continuous addition of reprocessed or virgin adsorbent

3.15 Counter-current adsorption

an adsorption process in which the flow of fluid is in a direction opposite to the movement

of the adsorbent

3.16 Critical bed depth

the minimum depth of an adsorbent bed required to contain the mass transfer zone

3.17 Crushing strength

the property of a particle to resist physical breakdown when contained and subjected to a slowly increasing continuously applied force

3.18 Degassing

removal of gases from activated carbon

3.19 Density, absolute or true

the mass under specified conditions of a unit volume of a solid sorbent excluding its pore

volume and inter-particle voids

3.20 Density, apparent (bulk, packing)

the mass under specified conditions of a unit volume of a solid sorbent including its pore volume and inter-particle voids

3.21 Density, block/density, particle

the mass under specified conditions of a unit volume of a solid sorbent including its

pore volume but excluding inter-particle voids

3.22 Density, tamped

the density of packed bed of powdered carbon

3.23 Desorption

the separation of an adsorbate from a sorbent

3.24 Differential heat of adsorption

the heat evolved during the adsorption of an incremental quantity of adsorbate at a given

level of adsorption

3.25 Dosage

the quantity of substance applied per unit weight or volume of the fluid being treated

3.26 Dry basis

exclusive of any moisture which may be present

3.27 Dust

particulates capable of temporary suspension in air or other gases; also, particles smaller than an arbitrarily selected size

3.28 Dynamic adsorptive capacity

the quantity of a given component adsorbed per unit of adsorbent from a fluid, or fluid

mixture moving through a fixed bed at the breakpoint for that component

3.29 Effective size

the particle size, which corresponds to 10 percent finer on the cumulative particle size distribution curve

3.30 End point

the occurrence in the effluent of the maximum permissible concentration of an adsorbate of interest

3.31 Equilibrium adsorptive capacity

the quantity of a given component adsorbed per unit of adsorbent from a fluid or fluid mixture at equilibrium temperature and concentration, or pressure

3.32 Expanded bed

a bed of granular activated carbon through which a fluid flows upward at a rate sufficient to slightly elevate and separate the carbon without changing their relative positions

3.33 Fine mesh activated carbon

activated carbon in particle sizes predominantly between 180 μm and 45 μm

3.34 Fines, n

activated carbon with size smaller than the smallest nominal specified carbon size

3.35 Fixed bed

system whereby by, adsorption only occurs in a particular region of the bed, known as the mass transfer zone, which moves through the bed

3.36 Floaters

the material floating on the surface of water into which carbon has been added and has been thoroughly wetted

3.37 Fluidized bed

a bed of particles in which the fluid flows upward at a rate sufficient to suspend the particles completely and randomly in the fluid phase.

3.38 Freundlich adsorption isotherm

logarithmic plot of quantity of component adsorbed per unit of adsorbent versus

concentration of that component at equilibrium and at constant temperature, which approximates the straight line postulated by the Freundlich adsorption equation

$$X/M = kC^n$$

where:

X = quantity adsorbed,

M = quantity of adsorbent,

C = concentration, and

k and **n** = constants

3.39 Granular activated carbon

activated carbon in particle sizes predominantly greater than 180 µm.

3.40 Hardness

a generic term referring to the resistance of a particle to breakdown as measured by specific tests

3.41 Heat of adsorption

the heat evolved during adsorption

3.42 Hysteresis loop

the divergence between the paths of the adsorption and desorption isotherms (divergence from typical Freundlich adsorption isotherms)

3.43 Ignition temperature (kindling point)

the lowest temperature at which combustion will occur spontaneously under specified conditions

3.44 Impact strength

the property of a particle to resist physical breakdown when subjected to a rapidly increasing applied stress

3.45 Integral heat of adsorption

the sum of the differential heats of adsorption from zero to a given level of adsorption

3.46 Intermittent moving bed (pulse, slug)

an adsorption process characterized by upward flow of a fluid through a fixed bed of granular adsorbent with periodic withdrawal of spent adsorbent from the bottom of the bed and additions of reprocessed or virgin adsorbent to the top of the bed

3.47 Irreversible adsorption

adsorption in which the desorption isotherm is displaced toward higher equilibrium adsorption capacities from the adsorption isotherm

3.48 Isobar

a plot of quantity adsorbed per unit of adsorbent against equilibrium temperature when concentration or pressure is held constant.

3.49 Isotere

a plot of equilibrium concentration or pressure against temperature when the quantity adsorbed per unit of adsorbent is held constant

3.50 Isotherm

a plot of quantity adsorbed per unit of adsorbent against equilibrium concentration, or pressure, when temperature is held constant

3.51 Langmuir adsorption theory

the theory that assumes that the surface of an adsorbent has only uniform energy sites and

that adsorption is limited to a monomolecular layer

3.52 Langmuir isotherm

a plot of isothermal adsorption data which to a reasonable degree fits the Langmuir adsorption equation

3.53 Macropore

a pore with widths exceeding 50 nanometres (500 angstrom units)

3.54 Mean particle diameter

the weighted average particle size,, of a granular adsorbent computed by a standard procedure

3.55 Mesopore

a pore of width between 2 and 50 nanometres (20 and 500 angstrom units)

3.56 Micropore

a pore with width not exceeding 2 nanometres (20 angstrom units)

3.57 Moisture content

the water content of a substance as measured under specified conditions

3.58 Monomolecular layer

an adsorbed film, one molecule thick

3.59 Multimolecular layer

an adsorbed film more than one molecule thick

3.60 Oven drying loss

the reduction in weight resulting when a substance is heated in an oven under specified conditions

3.61 Pelleted activated carbon

a form of granular activated carbon consisting of cylindrical particles

3.62 Physical adsorption (van der Waals adsorption)

the binding of an adsorbate to the surface of a solid at energies approximating those of condensation

3.63 Pore diameter

the diameter of a pore in a model in which the pores in a sorbent are assumed to be cylindrical in shape and which is calculated from data obtained by a specified procedure

3.64 Pores

the complex network of channels in the interior of a particle of a sorbent

3.65 Pore volume

volume of the pores in a unit weight of a sorbent

3.66 Pore volume distribution

the distribution of pore volumes among pores of different sizes or diameters

3.67 Powdered activated carbon

activated carbon with a mean particle diameter less than 45 μm

3.68 Preferential adsorption

adsorption in which one or more components are adsorbed to a much greater extent than

others

3.69 Reactivation (revivification)

oxidation of organic foulants for restoring the adsorptive properties of a spent sorbent

3.70 Regeneration

distillation or elution-type processes for restoring the adsorptive properties of a spent sorbent

3.71 Relative efficiency

the rating of the adsorptive capacity of an adsorbent based on a comparison of its performance with that of a reference adsorbent in a defined test

3.72 Retentivity

the ability of an adsorbent to resist desorption of an adsorbate

3.73 Reversible adsorption

adsorption in which the desorption isotherm approximates the adsorption isotherm

3.74 Service life (service time)

the elapsed time until the end point is reached in an adsorption process

3.75 Split feed

a liquid-phase adsorption process in which a powdered adsorbent is added to the solution to be treated in two or more steps, with or without intermediate separation of the adsorbent

3.76 Surface area

the total surface area of a solid calculated by the B.E.T. (Brunauer, Emmett, Teller)

equation, from nitrogen adsorption or desorption data obtained under specified conditions

3.77 Surface area distribution

the distribution of surface area according to some parameter such as pores of different size

or diameter

3.78 Uniformity coefficient

the ratio of the particle diameter corresponding to 60 % finer on the cumulative particle size distribution curve to the particle diameter corresponding to 10 % finer on the same distribution curve or calculated as the ratio of the size, expressed in mm, for 60% by weight of granules are smaller divided by the effective size. The smaller the uniformity coefficient, the more uniform the particles of the product

3.79 Wettability

the rate at which particles can be made wet under specified conditions