28.25 - Hydrazine and hydroxylamine and their inorganic salts; other inorganic bases; other metal oxides, hydroxides and peroxides.

2825.10 - Hydrazine and hydroxylamine and their inorganic salts

2825.20 - Lithium oxide and hydroxide

2825.30 - Vanadium oxides and hydroxides

2825.40 - Nickel oxides and hydroxides

2825.50 - Copper oxides and hydroxides

2825.60 - Germanium oxides and zirconium dioxide

2825.70 - Molybdenum oxides and hydroxides

2825.80 - Antimony oxides

2825.90 - Other

This heading covers :

(A) **Hydrazine and hydroxylamine and their inorganic salts**.

(B) **The metal oxides, hydroxides and peroxides of this Chapter not included in preceding headings**.

The most important products are :

(1) **Hydrazine and its inorganic salts**.

Hydrazine ($NH_2.NH_2$), a basic product prepared by the oxidation of ammonia with sodium hypochlorite. Also exists as the hydrate ($NH_2.NH_2.H_2O$). Colourless, lachrymatory liquid which fumes in the air. A powerful reducing agent, used in the manufacture of a priming explosive or in chemical synthesis.

Inorganic salts of hydrazine, obtained by reaction with mineral acids, are also classified here. The most important is **hydrazine sulphate**, colourless crystals which are slightly soluble in cold water and decompose violently when heated; this sulphate is used as a reagent in analysis, and in metallurgy (to separate polonium from tellurium).

Organic derivatives of hydrazine are **excluded** (**heading 29.28**).

(2) **Hydroxylamine and its inorganic salts**.

Hydroxylamine (NH_2OH) is a basic product obtained by hydrolysis of nitromethane; colourless, deliquescent crystals, very soluble in water, melting at 33 ºC, decomposing violently at 130 ºC.

Inorganic salts of hydroxylamine, obtained by reaction with mineral acids, also fall in this heading. The most important are hydroxyammonium **chloride**, **sulphates** and nitrate, white or colourless crystals soluble in water. They are used as reducing agents in organic synthesis, as anti-oxidants for fatty acids, in the bleaching, dyeing or printing of textiles, and as reagents, etc.

Organic derivatives of hydroxylamine are **excluded** (**heading 29.28**).

(3) **Lithium oxide and hydroxide**. The oxide (Li_2O) and its hydroxide (LiOH) are obtained from lithium nitrate. They are white powders, soluble in water, used in photography and for the preparation of lithium salts.

(4) **Vanadium oxides and hydroxides**. The most important vanadium oxide is divanadium pentaoxide (vanadium anhydride) (V_2O_5), obtained from the natural vanadates, vanadinite (heading 26.15) and carnotite (heading 26.12). It may be either amorphous or crystalline, in lumps or in powder. Colour ranges from yellow to reddish-brown; it turns red when exposed to heat and is almost insoluble in water. Used for preparing vanadium salts, certain inks, and as a catalyst (manufacture of sulphuric acid, phthalic anhydride or synthetic ethanol).

There are several hydroxides, constituting acids, from which the various vanadates of heading 28.41 are derived.

(5) **Nickel oxides and hydroxides**.

(a) **Nickelous oxide** (NiO) is obtained by thoroughly calcining the nitrate or the carbonate. A greenish-grey powder, the density and shade of which vary with the method of preparation. It is used in the enamel industry, in the glass industry as colouring matter and in organic synthesis as a catalyst. It is a basic oxide.

(b) **Nickelic oxide** (sesquioxide) (Ni_2O_3). A black powder used as colouring matter in the enamel industry and for the manufacture of alkaline accumulator grid plates.

(c) **Nickelous hydroxide** ($Ni(OH)_2$). A fine green powder used in electroplating, as a constituent of plates in alkaline accumulators and in the manufacture of nickel catalysts.

The heading **excludes** :

(a) Natural nickel oxide (bunsenite) (**heading 25.30**).

(b) Impure nickel oxides, e.g., nickel oxide sinters, nickel oxide in granular form (“ green nickel oxide ”) (**heading 75.01**).

(6) **Copper oxides and hydroxides**.

(a) **Cuprous oxide** (red copper oxide) (Cu_2O). Obtained from copper acetate or sulphate; a crystalline red powder, insoluble in water. Used for colouring glass red (glass for signals), manufacturing antifouling paints or synthetic precious stones (artificial emeralds), and as a fungicide in agriculture.

(b) **Cupric oxide** (black copper oxide) (CuO). Prepared from copper nitrate or carbonate or by oxidising the metal. Black powder or grains with chestnut sheen, insoluble in water. Pigment used in the enamel, glass (green glass) or ceramic industries and in the preparation of paints. Also used for depolarising electric batteries and as an oxidising agent or catalyst in organic chemistry.

(c) **Copper hydroxides**. The most common of these is cupric hydroxide ($Cu(OH)_2$). Blue solid which, alone or mixed, constitutes a pigment (Bremen blue). It is also used in the manufacture of pigments (e.g., Peligot blue, permanent in artificial light) and of the ammoniacal solution known as " Schweitzer's reagent ", a solvent in the cuprammonium process of rayon manufacture.

Natural cuprous oxide (cuprite) and natural cupric oxide (tenorite) are **excluded** (**heading 26.03**).

(7) **Germanium oxides**. The most important germanium oxide is the dioxide (GeO_2) obtained in the metallurgy of the metal from natural copper germano-sulphide (germanite) (heading 26.17), or by hydrolysing the chloride. It is a white powder, slightly soluble in water. It is used for preparing germanium metal (for transistors, etc.), in medicine and in the manufacture of special glass.

(8) **Molybdenum oxides and hydroxides**. The most important molybdenum oxide is the trioxide (MoO_3), obtained from the natural sulphide, molybdenite (heading 26.13). It is a white crystalline product which turns yellow on heating; practically insoluble in water. Used as a catalyst in organic synthesis (manufacture of phthalic anhydride).

There are also blue oxides which are still used as such or in mixture (in the latter case, they fall in **Chapter 32**) by artists, under the names of molybdenum blue and mineral indigo.

Hydroxides include molybdic acid (H_2MoO_4), a white or yellowish powder, slightly soluble in water, used in the ceramic industry (glazes) or as a catalyst. The molybdates of heading 28.41 are derived from these hydroxides.

Natural molybdenum oxide (molybdenum ochre, molybdite) is **excluded** (**heading 25.30**).

(9) **Antimony oxides**.

(a) **Trioxide or antimonous anhydride** (Sb_2O_3). Obtained by oxidising the metal or from the natural sulphide (stibnite). White powder or needle-shaped crystals; practically insoluble in water. The term " antimony white " is used in reference both to the pure oxide of this heading, and to a mixture of that oxide with zinc oxide, which is classified in **Chapter 32**. Antimony trioxide is used in paints, as an opacifier in the enamel industry (enamelling of iron) and pottery industry (glazes), in the manufacture of glass with a low coefficient of expansion (lamp glass), and for producing synthetic precious or semi-precious stones (artificial rubies, topazes, garnets). It gives the antimonites of heading 28.41.

(b) **Pentaoxide or antimonic anhydride** (Sb_2O_5). Obtained by oxidising the metal or calcining the nitrate. A yellow powder, also used as an opacifier in the enamel industry. Gives the antimonates of heading 28.41.

(c) **Tetraoxide** (Sb_2O_4). White powder obtained by heating the pentaoxide.

The heading **excludes** ores, i.e., natural antimony trioxides (senarmontite and valentinite) and natural tetraoxide (cervantite) (**heading 26.17**).

(10) **Beryllium oxide and hydroxide**.

(a) **Oxide** (BeO). Prepared from beryllium nitrate or sulphate. White powder, insoluble in water; can be crystallised. Used for making beryllium salts, synthetic precious or semi-precious stones and as a catalyst.

(b) **Hydroxide** ($Be(OH)_2$). White powder resembling alumina in appearance.

(11) **Calcium oxide, hydroxide and peroxide**. This heading covers only the oxide (CaO) and the hydroxide ($Ca(OH)_2$), in the pure state (i.e., containing practically no clay, iron oxide, manganese oxide, etc.), such as the product obtained by calcining precipitated calcium carbonate.

The heading also covers fused lime obtained by fusing ordinary quicklime in an electric furnace. This product has a high degree of purity (approximately 98 % calcium oxide); it is crystalline and generally colourless. It is used, in particular, for refractory linings for furnaces, in the manufacture of crucibles and for addition to concrete, in small pieces, to increase its resistance to wear.

Calcium peroxide (CaO_2) is a white or yellowish powder, hydrated (usually with 8 H_2O), sparingly soluble in water. Used as a bactericide and as a detergent, in medicine and in the preparation of cosmetics.

Quicklime (calcium oxide) and slaked lime (calcium hydroxide) are **excluded** (**heading 25.22**).

(12) **Manganese hydroxides**.

(a) **Manganous hydroxide** ($Mn(OH)_2$). A whitish powder, insoluble in water.

(b) **Manganic hydroxide** ($Mn(OH)_3$). Derived from manganic oxide (Mn_2O_3). A brown powder used for preparing colours (manganese brown) and manganese linoleate.

(c) **Manganese saline hydroxide**. Derived from the saline oxide Mn_3O_4.

The heading **excludes** natural hydrated manganese oxide (natural manganic hydroxide) (manganite) which is an ore of **heading 26.02** and non-hydrated manganese oxides (**heading 28.20**).

(13) **Zirconium dioxide** (zirconia) (ZrO_2), not to be confused with zircon (**heading 26.15** or **71.03**), which is a crystallised natural zirconium silicate.

The artificial oxide is obtained from the above-mentioned ore or from zirconium salts. It is a refractory whitish powder with a melting point of about 2,600 °C. Zirconia is used as a refractory product resistant to the action of chemical agents, a pigment and ceramic opacifier (zirconium white), an abrasive, a constituent of glass and a catalyst.

Natural zirconium oxide or baddeleyite is an ore of **heading 26.15**.

(14) **Cadmium oxide and hydroxide**.

(a) **Oxide** (CdO). Powder of a more or less brownish-yellow colour according to the calcination temperature during the preparation from the carbonate or the hydroxide. Used in the ceramic industry and as a catalyst.

(b) **Hydroxide** ($Cd(OH)_2$). White powder.

(15) **Tin oxides and hydroxides**.

(a) **Stannous oxide** (brown oxide) (SnO). Insoluble in water. It may be grey or black crystals, or olive-brown powder with bluish, reddish or greenish glints, according to the process of preparation.

This oxide is amphoteric and gives the stannites of heading 28.41. It is used in organic synthesis as a reducing agent or catalyst.

(b) **Stannic oxide** (stannic anhydride, dioxide) (SnO_2), also insoluble in water, is a powder, white (tin white) or grey (tin ash). The white oxide is used in the ceramic or glass industries as an opacifier, whereas the grey powder is used for polishing metal, mirrors, etc., and also for obtaining vitrifiable compounds. This oxide is sometimes known as " putty powder ", but this term also covers mixtures of this oxide with lead oxide, which fall in **heading 38.24**.

Stannic oxide is amphoteric and gives the stannates of heading 28.41.

(c) **Stannic acid** or **stannic hydroxide** ($Sn(OH)_4$). Obtained by the action of an alkali hydroxide on a stannic salt. A white powder which turns into meta-stannic acid.

(d) **Meta-stannic acid**. Obtained from stannic acid; a powder, insoluble in water. Used as an opacifying colour in ceramics and an abrasive in the glass industry.

These stannic acids give the stannates of heading 28.41.

This heading **does not include** :

(a) Natural tin oxide (cassiterite), an ore (**heading 26.09**).

(b) Tin dross, a mixture of tin oxide and tin obtained during the melting of the metal (**heading 26.20**).

(16) **Tungsten oxides and hydroxides**. The most important tungsten oxide is tungstic oxide (tungstic anhydride, tungsten trioxide) (WO_3), obtained in the metallurgy of this metal by treating the natural tungstates (wolframite or scheelite) (heading 26.11). It is a lemon-yellow, crystalline product which turns orange on heating and is insoluble in water. Used for preparing the tungsten for electric bulb filaments and in ceramic paints.

There are several hydroxides, including tungstic acid (H_2WO_4) (yellow hydrate), which gives the normal tungstates of heading 28.41.

Natural tungsten oxide (tungsten ochre, tungstite) is **excluded** (**heading 25.30**).

(17) **Bismuth oxides and hydroxides**.

(a) **Dibismuth trioxide** (Bi_2O_3). Prepared from bismuth nitrate or carbonate. Pale yellow powder, insoluble in water and turning red when heated. Used in the glass or ceramic industries.

(b) **Dibismuth pentaoxide** (red oxide) (Bi_2O_5). Brownish-red powder.

(c) **Bismuth hydroxide** ($Bi(OH)_3$).

Natural bismuth ochre, which mainly consists of the trioxides, is **excluded** (**heading 26.17**).

This heading **does not include** mercury oxides **(heading 28.52)**.