28.09 - Diphosphorus pentaoxide; phosphoric acid; polyphosphoric acids, whether or not chemically defined.

2809.10 - Diphosphorus pentaoxide

2809.20 - Phosphoric acid and polyphosphoric acids

This heading covers diphosphorus pentaoxide, phosphoric acid (orthophosphoric acid or common phosphoric acid), pyrophosphoric (diphosphoric) acid, metaphosphoric and other polyphosphoric acids.

(A) DIPHOSPHORUS PENTAOXIDE

Diphosphorus pentaoxide (phosphorus (V) oxide, phosphorus pentoxide, phosphoric anhydride) (P_2O_5) is obtained by combustion, in dry air, of phosphorus extracted from natural phosphates. It is a very corrosive white powder, absorbs water avidly, and is transported in airtight packings. It is used for drying gases, and in organic synthesis.

Diphosphorus pentaoxide exists in crystalline, amorphous or vitreous form. These three varieties mixed together give " phosphoric snow ", classified here.

(B) PHOSPHORIC ACID

Phosphoric acid (orthophosphoric acid or common phosphoric acid) (H_3PO_4) is obtained by the action of sulphuric acid on natural tricalcium phosphate. The commercial acid thus prepared contains as impurities diphosphorus pentaoxide, calcium dihydrogenorthophosphate, sulphur trioxide, sulphuric acid, fluorosilicic acid, etc. Pure phosphoric acid is obtained by controlled hydration of diphosphorus pentaoxide.

Phosphoric acid may be in the form of deliquescent prismatic crystals, but, as it is difficult to preserve in the solid state, it is usually put up in aqueous solutions (e.g., 65 %, 90 %). The concentrated solution, which remains supersaturated at room temperature, is sometimes known as " syrupy phosphoric acid ".

Phosphoric acid is used to prepare concentrated (triple) superphosphates; it is also employed in the textile industries and as a pickling (rust-removing) agent.

Phosphoric acid by condensation at high temperature gives rise to several polymeric acids : pyrophosphoric (diphosphoric) acid, metaphosphoric acids and other polyphosphoric acids.

(C) POLYPHOSPHORIC ACIDS

(I) **Acids characterised by alternating P-O-P atoms are classified here**.

They may be derived formally by condensing two or more molecules of orthophosphoric acid with elimination of the elements of water. In this way, a series of linear acids of general formula $H_{n+2}P_nO_{3n+1}$, where n is 2 or more, and a cyclic series of general formula $(HPO_3)_n$, where n is 3 or more, can be generated.

(1) Pyrophosphoric acid (diphosphoric acid, $H_4P_2O_7$) is formed by controlled heating of orthophosphoric acid. It is unstable in moist air and readily reconverts to the orthoacid.

(2) Metaphosphoric acids. These are the cyclic acids exemplified by **cyclo**-triphosphoric acid $(HPO_3)_3$ and **cyclo**-tetraphosphoric acid $(HPO_3)_4$, which occur as minor components of mixed polyphosphoric acids containing more than 86 % P_2O_5. Glacial polyphosphoric acid (commercial metaphosphoric acid) is a non-chemically defined mixture of polyphosphoric acids (mainly linear), which may also contain sodium salts thereof. Such mixtures, which are classified here, occur as vitreous masses, volatilising at red heat and are uncrystallisable.

They are highly absorbent of water and are used for drying gases.

(3) Other polyphosphoric acids of the P-O-P type. These are normally mixtures, marketed under the names " polyphosphoric " or " superphosphoric " acids, which contain higher members of the series such as triphosphoric acid ($H_5P_3O_{10}$) and tetraphosphoric acid ($H_6P_4O_{13}$). These mixtures are also classified here.

(II) **Other polyphosphoric acids**.

This part includes, *inter alia*, hypophosphoric acid (diphosphoric (IV) acid) ($H_4P_2O_6$). This compound is in the form of a crystalline dihydrate which must be kept in a dry place. It is more stable in weak solutions.

The heading **does not include** :

(a) Other phosphorus acids and anhydrides (phosphonic acid and its anhydrides, phosphinic acid) (**heading 28.11**).

(b) Hydrogen phosphides (**heading 28.48**).