its specific gravity (0·9735 at 13°·5 C.), and its fusing point (95°·6 C.). In thin layers its vapour is colourless, but dense fumes have a purple tint. It decomposes water violently, but the hydrogen evolved does not take fire, although the reaction is more dangerous than the corresponding pheno­mena developed by potassium, because it leads frequently to most violent explosions. Yet the process serves in practice for the preparation of pure soda hydrate. In this operation a piece of sodium is placed in a silver basin standing in a shallow cold-water bath. Drop by drop water is added—the metal between the additions being allowed to expend its energy—till the desired quantity of hydrate is formed. The process, in short, is so conducted that, except at first, the metal never touches water in any other form than that of a strong soda lye. Sodium is largely made for use as an agent in the manufacture of aluminium and magnesium, and as a reagent in laboratory operations. The metal does not affect carbonic oxide at any temperature ; it acts on hydrogen as potassium does ; but the compound is less stable. On ammonia gas it acts, as in the parallel case of potassium, with the formation of NH2Na, only the reaction is less energetic. Sodium has less powerful affinity to oxygen than potassium ; in dry air or oxygen it burns into the dioxide Na2O2,—a product obtainable also by heating the nitrate or nitrite. A white solid soluble in cold water, forming a hydrate, Na2O2 + 8H2O, is obtainable in crystals, the solution of which is strongly alkaline. With acids it yields sodium salts and peroxide of hydrogen. Sodium tetroxide (Na2O4) is not known to exist.

*Caustic Soda* (NaHO) is prepared from carbonate by means of caustic lime, just as caustic potash is made from its carbonate (see Potassium). The analogy between the two caustic alkalis is so perfect that we need only summarize the points of difference between them. Com­pared with caustic potash, caustic soda is less easily soluble in water, less caustic, less energetically basilous, less prone when fused in air to pass into peroxide, hence less de­structive to platinum, iron, nickel, and silver vessels.

*Sodium Chloride* (NaCl) occurs in nature in a nearly pure state. Absolutely pure salt is made from commercial salt by precipitating from a solution the lime and magnesia by pure carbonate of soda, filtering, neutralizing with pure hydrochloric acid, concentrating by evaporation, and then precipitating the pure salt by a stream of hydrochloric acid gas. The crystalline precipitate is collected over glass wool, washed with pure fuming hydrochloric acid, and dried by heating in a platinum basin. It forms non- hygroscopic crystals, free from combined water, having a specific gravity at 16° C. of 2·162 (Stolba), and according to Carnelley fusing at 776° C. The solubility of pure salt in water is almost independent of temperature ; 100 parts of water dissolve—

at 0° 14° 60° 100β 109°∙7

(boiling)

35∙52 35∙87 37·25 39∙61 40·53 parts of NaCl.

Regarding its commercial relations, &c., see Salt.

*Chlorate of Soda* (NaClO3) is a salt of some industrial importance, from its use in the manufacture of aniline black. It may be made from the potash salt (*a*) by de­composing this with hydrofluosilicic acid (which precipi­tates the potassium as fluosilicate and yields a solution of chloric acid), and neutralizing the chloric acid solution with soda, or (*b*) by double decomposition with bitartrate of soda, NaHC4H4O6,—the cream of tartar (KHC4H4O6) separating out almost completely, whilst the chlorate of soda remains in solution. According to Weldon, it is best manufactured from caustic soda by the direct action of chlorine, the two salts NaCl and NaClO3 being separated by crystallization. Chlorate of soda forms cubes which often exhibit tetrahedral faces; 100 parts of water dis­

solve at 0° 81·9, at 20° 99, and at 100° C. 233 parts of the salt. Hence it is much more soluble than the potash salt, on which account it is preferred for aniline black printing.

*Sulphate* (Na2SO4) is the most largely produced of all soda salts in manufacturing operations, although it is re­garded principally as an intermediate product. The an­hydrous salt readily combines with water into a crystalline soluble compound, Na2SO4 + 10H2O, known as Glauber’s salt. This forms large transparent monoclinic crystals, and is characteristically prone to form supersaturated solutions. 100 parts of water dissolve—

at 0° 11∙67 25°·05 32°∙73 33°∙88

12·17 26∙38 99·18 32·21 3121 parts of Na2SO4 +10 H2O,

5∙02 10·12 28·11 50·65 50·1 parts of NaSO4.

As the temperature rises beyond about 33°, the solu­bility decreases (Gay-Lussac). Glauber’s salt, when ex­posed to dry air, especially in summer heat, gradually falls into a powder of anhydrous sulphate. It is much less volatile than the chloride. The thiosulphate, Na2S2O3 (commercial hyposulphite of soda), and soda salts of other lower sulphur acids, are reserved for Sulphur.

Of all sodium compounds, except common salt, the car­bonates are by far the most important, both industrially and chemically. These comprise the following.

*Normal Carbonate,* Na2CO3.—The anhydrous salt usually presents itself in the form of a white opaque porous solid, specific gravity 2·65 (Karsten). According to Carnelley, it fuses at 818° C. (dull red heat) into a colourless liquid. On fusing it loses some of its carbonic acid, and at a bright red heat it volatilizes appreciably. The porous salt absorbs water from the air ; when moistened with water it gives off heat and unites into crystalline hydrates, of which the important compound is

*Decahydrate,* Na2CO3 + 10H2O.—This salt, known as soda crystals or washing soda, forms large transparent monoclinic rhomboidal prisms or double pyramids. The salt dissolves readily in water, forming strongly alkaline solutions, which emulsionize fats, though less readily than is done by caustic lyes. 100 parts of water dissolve—

at 0° 15° 20° 30° 38° 104°

21∙33 63∙20 92·82 273·6 1142·2 539·6 of crystals,

6·97 16∙20 21∙71 37·24 51·67 46·17 of Na2CO3

(Löwel). According to this observer, the dissolved salt from 38° C. upwards assumes the form of lower hydrates, hence the diminution in solubility at higher temperatures. A saturated solution, when evaporated down by heat, deposits a granular salt of the composition Na2CO3(H2O or 2H2O). The decahydrate, when exposed to dry air even at ordinary temperatures, loses water, with the forma­tion of monohydrate, Na2CO3H2O. It also readily takes up carbonic acid with the formation of

*Bicarbonate,* NaHCO3.—Its formation may be thus for­mulated—Na2CO3 + 10H2O + CO2 = 2NaHCO3 + 9H2O. The bicarbonate remains as a crystalline mass, while the liberated water runs off with more or less of dissolved car­bonate and the saline impurities which may be present. Bicarbonate forms small four-sided monoclinic plates with a feebly alkaline taste and reaction. 100 parts of water dissolve—

at 0° 20° 40° 60º

6∙90 9∙60 12∙70 16·10 of NaHCO3

(Dibbits). From about 70° C. upwards the solution gives off carbonic acid with formation of *Sesquicarbonate,—*2Na2O + 3CO2 + 4H2O = Na2CO32NaHCO3 + 3H2O. This salt, found in nature as trona or urao, forms in its pure state crystals which do not lose water in the air. At 20° C. 100 parts of water dissolve 18·3 parts of the salt calculated as anhydride, 2Na2O3CO2. Both bicarbonate and sesquicar­bonate when heated dry break up readily (below redness) into normal carbonate, water, and carbonic acid.