*Historia* (1582), as translated by Monypenny (1612), says of the Highlanders, “they delight in marled clothes, specially that have any long stripes of sundry colours ; they love chiefly purple and blue. Their predecessors used short mantles or plaids of divers colours sundry ways divided ; and amongst some the same custom is observed to this day.” A hint of clan tartan distinctions is given by Martin in his *Western Isles of Scotland* (1703), which work also contains a minute description of the dress of the High­landers and the manufacture of tartan. “Every isle,” he observes, “ differs from each other in their fancy of making plaids, as to the stripes in breadth and colours. This humour is as different through the mainland of the Highlands, in so far that they who have seen those places is able at the first view of a man’s plaid to guess the place of his residence. ”

See W. and A. Smith, *Tartans of the Clans of Scotland,* 1850; J. Sobieski Stuart, *Vestiarium Scoticum,* 1842 ; R. R. M'Ian, *Clans of the Scottish Highlands,* 1845-46 ; J. Grant, *Tartans of the Clans of Scotland,* Edinburgh, 1885.

TARTARIC ACID, in its ordinary acceptation, refers to one acid, (C4H4O6)H2, which occurs in most acid fruit juices, in association generally with malic or citric, or both. Grape-juice owes its sourness almost entirely to acid tartrate of potash. While the juice ferments into wine, the greater part of the acid tartrate separates out, along with tartrate of lime, colouring matter, and other impurities, as a hard crust adhering to the sides of the cask. Such impure acid tartrate of potash is known commercially as “argol.” It was known to the Greeks as *τpύξ,* to the Romans as *fæx vini.* The alchemists from the 11th century called it *tartarus,* which name has survived in familiar chemical parlance to this day. The true constitution of *tartarus vini* was discovered by Scheele in 1769. He was the first to isolate the acid from its acid potash salt by a method which is still used for its industrial extraction.

*Manufacture.—*Crude tartar (10 to 14 cwts.) is placed in a tank, and dissolved in sufficient water with the help of steam. The surplus acid is then neutralized by addi­tion of powdered chalk, and precipitated as lime salt:—

2(C4H4O6)KH = (C4H4O6)K2 + (C4H4O6)H2 ;

normal salt. acid

(C4H4O6)H2 + Ca CO3=(C4H4O6)Ca + H2O + CO2.

The other half of the tartaric acid which remains dissolved as normal potash salt is then precipitated in the same form by addition of chloride of calcium :—

(C4H4O6)K2+CaCl2 = 2KCl+ (C4H4O6)Ca.

The tartrate of lime precipitate is collected, washed, and decomposed by an excess of sulphuric acid at 75o C. :—

(C4H4O6)Ca + H2SO4=CaSO4 + (C4H4O6)H2.

The sulphate of lime is removed by decanting and filter­ing. and the acid solution evaporated in leaden pans to a sufficient degree to deposit crystals on standing in the cold. The crystals are purified by redissolving them in hot water, decolorizing the solution with animal charcoal, and causing the acid to crystallize a second time after addition of sulphuric acid, which promotes the formation of large crystals. The crystals contain a little sulphuric acid and a trace of lead ; if intended for internal use, they must be recrystallized from pure water.

Tartaric acid forms hard colourless transparent mono­clinic prisms of 1∙764 spec. grav., easily soluble in cold and abundantly in hot water. It has a strong but agree­able sour taste. At 15o C. 100 parts of water dissolve 138 parts of the acid, 100 of alcohol (absolute) 20∙4, and 100 of ether 0∙39. It fuses at 135o C. and passes into an amorphous modification known as meta-tartaric acid ; when heated more strongly it loses water, and passes into the forms of anhydrides. At high temperatures it is decomposed with formation of charcoal and volatile pro­ducts, which smell pretty much like those formed from sugar in the same circumstances. Most oxidizing agents produce formic from the aqueous acid. Boiling with oxide of silver and excess of caustic alkali produces oxalate.

Tartaric acid is used largely in calico printing as a discharge. In pharmacy and households it serves, con­jointly with bicarbonate of soda or potash, for the extem­poraneous preparation of effervescing drinks. The so- called German effervescing powders are a combination of weighed-out doses of tartaric acid and of bicarbonate of soda. In the so-called “ seltzogènes ” (glass apparatus in which carbonic acid is produced in one compartment, to be forced by its own pressure into a mass of water, wine, &c., in the other) the gas is similarly produced.

*Tartrates.—*The *acid potash salt,* (C4H4O6)HK, “cream of tartar,” is prepared from crude tartar (argol) by dissolving it in hot water, filtering off what remains of tartrate of lime and other impurities, and allowing the filtrate to crystallize. The crystals are generally contaminated with a little of the lime-salt, for the removal of which the best method is to treat the powdered crystals with cold dilute hydrochloric acid and then wash them with cold water by displacement. The lime passes into the filtrate. Cream of tartar forms small colourless hard crystals which dissolve in about 200 parts of cold and in 15 parts of boiling water. In alcohol the salt is even less soluble than in water.

The *normal* (neutral) *potash salt,* (C4H4O6)K2 + ½H2O, is prepared by dissolving powdered cream of tartar in hot solution of carbonate of potash until a neutral or slightly alkaline solution is produced. The salt, being extremely soluble in water, does not crystallize very readily. In former times the carbonate of potash required used to be made by igniting one half of the cream of tartar to be operated upon in a crucible. Hence the name of *tartarus tartaris- atus,* which is still familiar in pharmacy. The salt is used medi­cinally, and also for removing free acid from excessively sour wine by formation of relatively insoluble bitartrate (Liebig’s method).

*Rochelle salt,* (C4H4O6)KNa + 4H2O, is prepared by not quite neutralizing hot solution of carbonate of soda with powdered cream of tartar. The (filtered) hot solution deposits on cooling magnificent crystals, readily soluble in water, though less so than the unmixed potash salt. Rochelle salt is used as a mild purgative. The so-called Seidlitz powders are effervescing powders with a con­siderable addition of Rochelle salt to the bicarbonate.

The normal tartrates of lime, baryta, &c., are insoluble precipi­tates producible by double decompositions.

*Tartar emetic,* (C4H4O6)K(SbO) + ½H2O, is produced by boiling 4 parts of oxide of antimony, Sb2O3, and 5 of powdered cream of tartar with 50 of water for about an hour. The filtered solution, on cooling, deposits crystals of the above composition soluble in 15 parts of cold and 2∙8 of boiling hot water. The crystals gene­rally exhibit the appearance of tetrahedra ; yet they are rhombic prisms combined with pyramids. The process going on in the formation of the salt is easily understood if we remember that Sb2O3 often acts on aqueous acids as if it were the monoxide, (SbO)2O, of a radical (SbO) antimonyl. (SbO)2O + H2O is equi­valent to 2(SbO)OH, and

(C4H4O6)KH + OH(SbO) = H2O + (C4H4O6)K(SbO).

Tartar emetic has long had a standing in medicine. In doses of 1-3 grains it acts as a powerful emetic ; very small doses (1/60 to 1/10 grain) induce perspiration. Large doses produce poisonous effects.

*Analysis.—*Tartaric acid is characterized chiefly by the relative insolubility of its acid potash salt. To produce it from a solution of a neutral tartrate, add acetic acid and acetate of potash, and stir vigorously; the salt gradually separates out as a crystalline precipitate. Neutral tartrate solutions, with chloride of calcium, give a precipitate of tartrate of lime, which is at first amorphous, and in this condition dissolves pretty readily in excess of reagent or tartrate, but in general re-separates in the crystalline form (the undissolved tartrate likewise becomes crystalline) on standing.

*Anhydrides.—*Tartaric acid, when kept at 135o, fuses and becomes meta-tartaric acid without change of weight, and on continued appli­cation of 140-150° C., ditartrylic acid, C8H10O11 = 2C4H6O6-H2O; and at 180° tartrelic acid, C8H8O10 = 2C4H6O6 - 2H2O, is produced. All these three acids form salts of their own, which, however, tend to become tartrates in the presence of water. At 180° real tartaric anhydride (like tartrelic, C8H8O10 = 2C4H4O5) is produced, in addi­tion to tartrelic acid, as an infusible yellowish mass, insoluble in water and in ether. By continued contact with water it is con­verted finally into tartaric acid solution.

*Isomeric Modifications.—*Among these *racemic acid* has long been known as an occasional bye-product in the manufacture of tartaric acid. It used to be believed that racemic acid is present ready formed in certain grape-juices, and thus comes to make its appear­ance occasionally; but it is well known now that the bulk of it at any rate is produced from what was originally tartaric acid, by the continued action of high temperatures and water. Racemic acid is almost identical with tartaric acid ; the only purely chemical point of difference is that corresponding salts of the two acids often crystallize with different proportions of water. The two acids, however, are easily distinguished by their action on polarized light (see Polarity, vol. xix. p. 314). A solution of tartaric acid turns the plane of polarization to the right ; racemic acid is, in this sense,