



Solubility of carbonate of lime in water containing carbonic acid

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SOLUBILITY OF CARBONATE OF LIME IN WATER CONTAINING CARBONIC ACID. BY M. LASSAIGNE.

The solubility of carbonate of lime in water containing carbonic acid has been long known to geologists, mineralogists and chemists ; it is in this state that all waters which contain this calcareous salt convey it for the assimilation of plants and animals.

The spontaneous precipitation of this salt, by contact of the air, fully explains the cause of the deposits formed by the water, and of the incrustations, frequently so abundant, which occur on the surface of bodies exposed to the water for a certain time.

There are other facts, however, connected with the subject which have not been examined into : such are the degree of solubility of carbonate of lime at common temperatures in water saturated with carbonic acid, and the state of saturation in which the salt exists in this condition.

The plan on which M. Lassaigue operated was to prepare a solution of pure carbonic acid by agitating at a temperature of 50° F. and a pressure of 29·7 inches : in this solution chalk reduced to a fine powder was digested for twelve hours.

The solution obtained was filtered to separate the excess of carbonate of lime, and was perfectly limpid ; it reddened tincture of litmus slightly, but had no immediate effect on syrup of violets ; but after several hours' contact the solution became gradually green. The solution when treated with a little potash became immediately turbid, and deposited white flocculi of hydrated carbonate of lime, which soon diminished in volume by losing water, and were converted into a white powder, which partly adhered to the sides of the vessel ; the same effects were obtained with ammonia. When the solution was heated it became turbid, as the gas was expelled by the action of the heat, and carbonate of lime was precipitated.

It was found by experiment that the carbonic acid, which effected the solution of the carbonate of lime, was five times greater than that which existed in the carbonate of lime dissolved at 50°.

This result indicates that the calcareous salt to be dissolved in water by carbonic acid, is directly converted into sexticarbonate of lime, that is to say, into a compound of one equivalent of lime and six equivalents of carbonic acid, which would give $\text{CaO}, 6\text{CO}_2$ as the formula of the soluble salt. M. Lassaigue thinks it probable that this is the state in which the combination exists in certain spring waters which contain it, unless it be regarded as a bicarbonate of lime, rendered soluble by four equivalents of free carbonic acid. The author is, however, disposed to consider the first hypothesis as more conformable to the theory of the saturation of metallic oxides with oxacids.

In operating at the temperatures of 50° F. and 32° F., a difference was observed in the solubility of neutral carbonate of lime in the same solution of carbonic acid. At the former temperature, a volume of the saturated water dissolved 0·00088 of its weight of

carbonate of lime, while an equal volume at 32° dissolved only 0·00070.

This decided difference proves then that the solubility of carbonate of lime in water impregnated with carbonic acid, varies with the temperature, at least within the limits of 32° and 50° F., which were those at which the experiments were made.—*Journ. de Ch. Méd.*, Fevrier 1847.

SOLUBILITY OF PHOSPHATE OF LIME IN WATER SATURATED
WITH CARBONIC ACID. BY M. LASSAIGNE.

The solution of carbonic acid employed in these experiments was saturated at the temperature of 50° F., and at a pressure of 29·9 inches; the phosphate employed was left in the solution in each case during twelve hours; and the quantity dissolved was ascertained by evaporating the same volume of each solution to dryness and weighing the residue.

1. *Pure phosphate of lime*, obtained by the double decomposition of a calcareous salt and alkaline phosphate; the solubility was 0·000750.

2. *Fresh bone*, a piece of nearly two inches long, $\frac{46}{100}$ dths of an inch wide, and $\frac{17}{100}$ dths thick; solubility 0·000166.

3. *Bone disinterred* after about twenty years' repose in a cemetery, the subsoil of which was sandy; solubility 0·000300.

M. Lassaigne remarks that these facts confirm an opinion advanced by M. Dumas, that bones which have suffered incipient decomposition in the earth, and which have consequently become less coherent, yield a larger quantity of their calcareous salts to water saturated with carbonic acid, than fresh bones containing all their organic matter.—*Journ de Ch. Méd.*, Janvier 1847.

CRYSTALLIZED BILE.

M. Verdeil effects the crystallization of bile by the following process:—Fresh ox-bile is to be dried by the water-bath, and the residue is to be treated with about twenty parts of absolute alcohol. By this the mucus remains insoluble, whilst the bilate of soda readily dissolves. The solution is to be filtered and treated with animal charcoal to decolorize it; æther is then to be cautiously added to it until it begins to turn milky, and is then to remain in a closed vessel. Crystallization occurs after some time; the bilate is then deposited on the sides of the vessel in the form of small acicular crystals in concentric groups. In twenty-four hours the liquor is to be poured off; and the crystals, after being washed with æther free from alcohol, are to be dried over sulphuric acid.

The crystals thus obtained always contain a little common salt; from this they are freed by placing them with absolute alcohol in a freezing mixture: this salt does not dissolve under these circumstances.

Pure bilate of soda dried at 212° F. yielded by analysis—