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# On the artificial formation of crystallized minerals

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Silica from.....	1	to 3 parts
Lead .....	1	to 5 ..
Copper .....	0.5	to 2.5 ..
Manganese.....	10	to 24 ..

After this determination, so easily effected, it became a curious subject of inquiry, whether the copper and the lead are disseminated throughout the whole mass of the blood, or if, as happens with the iron, they are confined to the red particles.

Experience has left no doubt on this subject. One kilogramme of the clot, carefully separated from the serum of many bleedings, yielded 0.083 gr. of lead and copper; one kilogramme of serum separated from the preceding clot yielded only 0.003 gr. of these two metals. These three milligrammes of lead and copper contained in the serum, ought undoubtedly to be attributed to the red globules dissolved or suspended in the lymph.

It appears, then, that the copper and the lead are not diffused throughout the blood, but are fixed with the iron in the globules; and everything leads to the conclusion that they contribute, as it does, to organization and to life. Do they exert a decided influence on the health? Does chlorosis exist on account of deficiency of copper, lead and manganese? or is their excess the secret cause of any obscure and disordered affection? Therapeutics ought to answer these questions, and enlighten us in its turn. Legal medicine, on its part, will perhaps draw up useful hints as to the permanent presence of these metallic poisons, and with respect to their enormous variations, even in the midst of life.—*Comptes Rendus*, Janvier 10, 1848.

#### ON THE ARTIFICIAL FORMATION OF CRYSTALLIZED MINERALS.

BY M. EBELMEN.

The author observes, that hitherto only two methods have been employed to obtain crystallized and definite combinations in the dry way. One consists in submitting to igneous fusion bodies, either simple or compound, alone or mixed with each other in certain proportions proper to constitute definite compounds. It often happens, in this case, that crystals are formed and are isolated throughout the fused mass during its cooling. It is in this way that various compounds which have been isolated, have been found in the products of glass-houses, and in the scoriæ of metallurgic processes, which M. Mitscherlich has found perfectly to resemble the products of the mineral kingdom. It is by the same method that M. Berthier has prepared a certain number of crystallized borates and silicates. It has as yet been applied only to compounds which are fusible at the temperature of the furnaces to which the mixture of substances is exposed.

The second method can only be employed with compounds which are distillable or volatile. It has long been known to chemists by the name of sublimation.

The process which M. Ebelmen has employed is perfectly new,

and quite different from the two preceding. The object was to discover a substance which possesses, at a high temperature, the property of water at common temperatures, or a little higher, with respect to the substances which it holds in solution. It is well-known that the evaporation of the water admits of the formation of many crystallized bodies.

It is well-known that there are some substances which are volatilized at very high temperatures, and which are nevertheless powerful solvents, when in fusion, of the greater number of metallic oxides; among these there may be cited boracic acid, borate of soda, phosphoric acid, and the alkaline phosphates. It seemed reasonable to suppose that, by employing some one of these substances with calculated proportions of certain oxides, and exposing the mixture to a high temperature in open vessels, crystallized combinations might be obtained by the evaporation of the solvent. Experiment perfectly confirmed this conjecture.

The author commences with the production of various minerals, which may be considered as formed of a compound of one equivalent of oxides constituted of two atoms of metal and three atoms of oxygen, with one equivalent of an oxide constituted of one atom of oxygen and one of metal.

The greater number of these minerals are very hard, and belong to the class of precious stones; and they constitute a natural family, comprehending a great number of species, as the spinelles, cymophane, chromate of iron, oxidulated iron, &c. All these minerals, except cymophane, are isomorphous, and generally crystallize in regular octahedrons. The author attempted to produce some of these minerals by the method just described.

*Spinelle*.—This, as is well-known, is an aluminate of magnesia, the formula of which is  $\text{Al}^2\text{O}^3\text{MgO}$ . Nature presents it to us possessing different colours. The red spinelle is that most valued by lapidaries, and it owes its colour to about  $\frac{1}{100}$ th of oxide of chromium. When the magnesia is partly replaced by protoxide of iron, the varieties are more or less coloured and opaque; all crystallize in regular octahedrons, slightly or not at all modified, with the exception of the variety known by the name of pleonaste, which crystallizes in rhombic dodecahedrons.

The hardness of the natural spinelle is 8; it scratches quartz readily; its density varies from 3.523 to 3.585.

All varieties are infusible by the blowpipe. The red varieties become black and opaque; on cooling they assume, by transmitted light, a greenish tint, and then their original colour is restored.

M. Ebelmen then proceeds to state, that having weighed each of the fixed matters separately which were to enter into the compound, and the fused boracic acid reduced to powder, the whole was heated on a sheet of platina in the mode which the author details. Various precious stones were formed, as spinelle of various colours and colourless, and cymophane, and several other crystalline compounds. To give an example of the method adopted, and the success attending it, we will quote the formation of the rose-coloured spinelle.

This was several times prepared, and the proportions followed in the greater number of experiments were—

Alumina.....	6·00 grs.
Magnesia .....	3·00
Fused boracic acid.....	6·00
Green oxide of chromium ....	0·10 to 0·15 gr.

By heating this mixture, well-defined and brilliant crystals of a rose-red colour were obtained, the form of which was easily distinguished by a glass. They were regular octahedrons, truncated on the twelve edges, constituting the *octaèdre émarginé* of Haüy. Quartz was readily scratched by the mass; by treating this with hydrochloric acid repeatedly, the crystals were left unacted upon and separate; their density was 3·548, while that of the natural spinelle varies from 3·523 to 3·585.

By analysis the author found these crystals to yield—

Alumina .....	71·9
Magnesia.....	27·3
Oxide of chromium ..	1·2
	<hr/> 100·4

the formula being  $\text{Al}^2\text{O}^3\text{MgO}$ , which agrees with the statement already made as to the composition of the rose spinelle. Various other crystals of this substance when submitted to analysis showed their agreement in composition with the natural minerals.—*Ann. de Ch. et de Phys.*, Février 1848.

#### ON THE CRYSTALLINE FORM OF METALLIC ZINC.

M. J. Nicklès observes, that the crystalline form of pure zinc has already been described by M. Noeggerath (*Poggendorff's Annalen*, vol. xxxix. p. 324), who found this metal in prisms with hexagonal bases. Zinc, antimony and arsenic, are then the only crystalline metals, the form of which does not belong to the regular system. The metals of the magnesian series do however crystallize in this system; and if zinc has hitherto formed an exception, it may be hoped that dimorphism will eventually connect this metal with the group of metals to which it belongs by its chemical properties; and the author mentions that he is enabled to state this fact already with respect to some crystals of pure zinc prepared by M. Favre according to the process of M. Jacquelin.

These crystals are very distinct pentagonal dodecahedrons, very similar to the form of iron pyrites and gray cobalt.

This example of dimorphism is not unique among metals. Prof. Miller, who has examined the crystalline form of tin, has shown that it crystallizes in the system of the prism with a square base. M. Frankenheim has observed the same metal crystallized in cubes; and very lately M. G. Rose (*Poggendorff's Annalen*, vol. lv. p. 329) has announced that platina and iridium are isodimorphous. Both crystallize in the rhombohedral and cubic system.