

CHEMISTRY

Discovering Metals In The Alkaline Earths

"A Classic of Science"

Revealing the True Nature of Lime and Its Relatives

ELECTRO-CHEMICAL RESEARCHES, ON THE DECOMPOSITION OF THE EARTHS; WITH OBSERVATIONS ON THE METALS OBTAINED FROM THE ALKALINE EARTHS, AND ON THE AMALGAM PROCURED FROM AMMONIA. By Humphry Davy. From *Philosophical Transactions of the Royal Society*. Read June 30th, 1808.

Attempts to procure the Metals of the alkaline Earths; and on their Properties

To procure quantities of amalgam sufficient for distillation, I combined the methods I had before employed, with those of MM. Berzelius and Pontin.

The earths were slightly moistened, and mixed with one-third of red oxide of mercury, the mixture was placed on a plate of platina, a cavity was made in the upper part of it to receive a globule of mercury, of from 50 to 60 grains in weight, the whole was covered by a film of naphtha, and the plate was made positive, and the mercury negative, by a proper communication with the battery of five hundred.

The amalgams obtained in this way, were distilled in tubes of plate glass, or in some cases in tubes of common glass. These tubes were bent in the middle, and the extremities were enlarged, and rendered globular by blowing, so as to serve the purposes of a retort and receiver.

The tube after the amalgam had been introduced, was filled with naphtha, which was afterwards expelled by boiling, through a small orifice in the end corresponding to the receiver, which was hermetically sealed when the tube contained nothing but the vapour of naphtha, and the amalgam. . .

In the best result that I obtained from the distillation of the amalgam of barytes, the residuum appeared as a white metal of the colour of silver. It was fixed at all common temperatures, but became fluid at a heat below red-

ness, and did not rise in vapour when heated to redness, in a tube of plate glass, but acted violently upon the glass, producing a black mass, which seemed to contain barytes, and a fixed alkaline basis, in the first degree of oxygenation.

When exposed to air, it rapidly tarnished, and fell into a white powder, which was barytes. When this process was conducted in a small portion of air, the oxygene was found absorbed, and the nitrogene unaltered; when a portion of it was introduced into water, it acted upon it with great violence and sunk to the bottom, producing in it barytes; and hydrogen was generated. The quantities in which I obtained it were too minute for me to be able to examine correctly, either its physical or chemical properties. It sunk rapidly in water, and even in sulphuric acid, though surrounded by globules of hydrogen, equal to two or three times its volume; from which it seems probable, that it cannot be less than four or five times as heavy as water. It flattened by pressure, but required a considerable force for this effect.

The metal from strontites sunk in sulphuric acid, and exhibited the same characters as that from barytes, except in producing strontites by oxydation.

The metal from lime, I have never been able to examine exposed to air or under naphtha. In the case in which I was able to distil the quicksilver from it to the greatest extent, the tube unfortunately broke, whilst warm, and at the moment that the air entered, the metal, which had the colour and lustre of silver, instantly took fire, and burnt with an intense white light into quicklime.

The metal from magnesia seemed to act upon the glass, even before the whole of the quicksilver was distilled from it. In an experiment in which I stopped the process before the mercury was entirely driven off, it appeared as a solid, having the same whiteness and lustre as the other metals of the

earths. It sunk rapidly in water, though surrounded by globules of gas, producing magnesia, and quickly changed in air, becoming covered with a white crust, and falling into a fine powder, which proved to be magnesia.

In several cases in which amalgams of the metals of the earths, containing only a small quantity of mercury were obtained, I exposed them to air on a delicate balance, and always found that during the conversion of metal into earth, there was a considerable increase of weight.

I endeavored to ascertain the proportions of oxygene, and bases, in barytes and strontites, by heating amalgams of them in tubes filled with oxygene, but without success. I satisfied myself, however, that when the metals of the earths were burned in a small quantity of air they absorbed oxygene, gained weight in the process, and were in the highly caustic or unslaked state; for they produced strong heat by the contact of water, and did not effervesce during their solution in acids.

The evidence for the composition of the alkaline earths is then of the same kind as that for the composition of the common metallic oxides; and the principles of their decomposition are precisely similar, the inflammable matters in all cases separating at the negative surface in the Voltaic circuit, and the oxygene at the positive surface.

These new substances will demand names; and on the same principles as I have named the bases of the fixed alkalis, potassium and sodium, I shall venture to denominate the metals from the alkaline earths barium, strontium, calcium, and magnium; the last of these words is undoubtedly objectionable, but magnesium has been already applied to metallic manganese, and would consequently have been an equivocal term.

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