Original Papers.

ON SOME OF THE PHYSICAL CHARACTERISTICS OF METALLIC BISMUTH.

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THE introduction of a soluble preparation of bismuth into medical use has invested the metal with an interest not heretofore realized by pharmaceutical chemists. Although the subnitrate has been officinal for many years, its preparation has been confined almost exclusively to the manufacturing chemist, and, as a consequence, druggists are not generally so well informed regarding its source and relations, as of those compounds resulting from the work of their own hands. The advent of *Liq. Bismuthi*, in the British Pharmacopœa of 1867, gave impetus to an inquiry which had been already set on foot by the secret preparation of Mr. Schact, and up to the present time, the discussion of bismuth, its compounds, and impurities, has been carried on with uninterrupted energy.

Previous to the middle of the sixteenth century, the ancients regarded bismuth as a peculiar form of lead, but G. Agricola, of Saxony, about the year 1546, (Ure.) proved its existence as a separate metal. Until quite recently, the old mines of Schneeberg, in Saxony, furnished the principal part of the bismuth of commerce. A few years ago, about ten thousand tons were produced annually, of late, the quantity has fallen off, owing to the mines not being fully worked. A small supply has been obtained from Cornwall and Cumberland, and the metal has been found in Australia and Peru. A large exportation was said to have been made from the former locality, last year, but the price appears to be as yet unaffected, being quoted at present, in London, at the extremely high figure of 22s. 6d. per pound.

There are a number of ores containing bismuth, but it occurs, principally, in the native state, associated with cobalt, arsenic, and silver, and is obtained as a secondary product in the reduction of those metals. As found in commerce, it is always impure, and is almost invariably contaminated with arsenic and copper, and occasionally, with silver, lead, iron, and thallium. Chemically pure bismuth was exhibited by Messrs. Johnson, Matthey & Co., the great refiners of London, at the late Paris Exhibition; they stated that it could be supplied in any quantity for 40s. a pound; but so far, there had been little demand for it.

A few weeks ago, we were shown a sample of a substance sold to a firm in this City. for metallic bismuth. It bore very little resemblance to that metal, and lacked the characteristic pink, or reddish tinge, always observable. In fact, it could scarcely be mistaken for anything but galena, and subsequent examination proved it to be such. This is a substitution which could, of course, only be practised on those not at all familiar with the appearance of bismuth.

The specific gravity of the pure metal is 9.83; its melting point is about 500° F., and in cooling it always assumes the crystalline form. Perfect crystals form a very pretty object for the shop window, and preserve their lustre for a long time. They may be best obtained by the following method:—Melt a quantity of ordinary bismuth in an iron ladle and pour it into a clay crucible, surrounded by hot sand or ashes; allow it to cool very slowly, and when a crust has formed on the surface of the metal, make two openings in it at opposite sides, by means of a red hot iron. Invert the crucible carefully and allow the metal to run out by one of the holes, while the air finds ingress by the other. Break the crucible as nearly as possible in two halves; the interior will be found to be lined with very beautiful, iridescent crystals in the form of cubes and hollow tetrahedrons.

Bismuth is in many respects a curious and peculiar metal, and in its physical properties proves rather an exception to the general rule. It has been stated that its specific gravity is 9.83; when subjected to a pressure of 200,000 pounds its density is 9.55, so that it actually gets lighter the more it is compressed. When fused it is heavier than in the solid state. In solidifying it expands one thirty second part of its bulk, and this property forms the basis of its application in type founding, as by the expansion the finest lines of the type mould are filled and a perfect letter produced. It has been found that in a mixture of bismuth with several other metals the specific gravity of the alloy is greater than the mean of its constituents. An alloy of bismuth, lead and tin constitutes the fusible metal discovered by Sir Isaac Newton, and melts at a much lower temperature than any of the metals composing it. According to Rose a mixture of two parts of bismuth, one of lead, and one of tin melts at 200°-75 F. Teaspoons are sometimes made of this alloy which disappear on stirring a hot cup of tea. It also serves a more useful purpose as a medium for taking impressions of objects which would be spoiled by a higher temperature, as of anatomical specimens, fruit, flowers, &c. The addition of a little mercury (about one part) renders this mixture still more fusible. Bismuth is not at all sonorous, but when alloyed with tin it communicates sound in a high degree, and for this purpose is much used in bell founding.

When subjected to a high temperature it volatilizes and may be distilled in close vessels.