CCLXXVI.—*Equilibrium Diagram of the System Antimony–Arsenic.*

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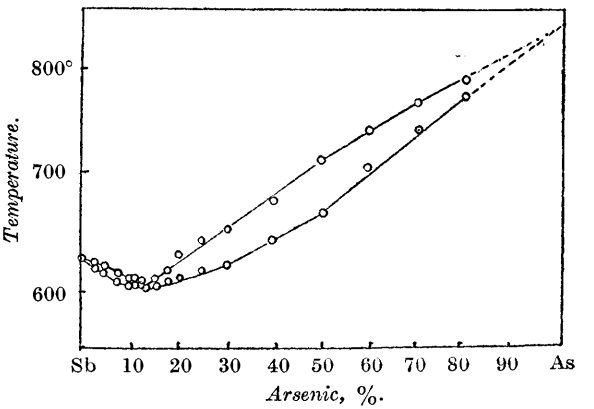
The fact that commercial antimony contains small quantities of arsenic suggested the possibility of the formation of antimony–arsenic alloys, and as no such alloys have been described, the present investigation was undertaken.

Preparation of Materials.—Pure arsenic was prepared as described by the author (*J. Inst. Metals*, 1922, **28**, No. 2); and pure antimony was prepared from the pure trichloride by conversion into oxychloride, which was dissolved in concentrated hydrochloric acid, distilled, reprecipitated, and reduced with sodium carbonate and potassium cyanide.

Alloys.—Accurately weighed quantities of the two metals (40—50 g. together) were placed in hard-glass tubes which were evacuated, sealed, packed in sand in an iron tube, and heated in an electric furnace, thorough mixing being effected by a rocking movement applied to the furnace when the metals were sufficiently mobile.

Equilibrium diagram of the system antimony–arsenic.



Alloy No.	As, %.	Thermal arrests. 1.	2.	Alloy No.	As, %.	Thermal arrests. 1.	2.
1	—	632°	—	10	17·5	625°	613°
2	2·5	630	626°	11	20	637	615
3	5	626	620	12	25	650	624
4	7·5	622	612	13	30	662	630
5	10	616	608	14	40	690	654
6	11	614	607	15	50	716	680
7	12	612	607	16	60	746	710
8	13	605	—	17	70	772	745
9	15	615	607	18	80	792	778

Thermal Analysis.—The temperature of the cooling alloy was recorded by a suspended mirror galvanometer and scale connected with a thermocouple, the hot junction being applied in close contact with the outside of the alloy tubes by means of fireclay. The rate of cooling was about 8° per min. at high temperatures and about 5° per min. below 500°. A cooling curve was always repeated whenever there was any doubt as to its accuracy. Half-minute readings gave the foregoing thermal arrests, from which the equilibrium diagram of the system was constructed.

As none of the arsenic sublimed in the upper part of the glass tube or separated from the alloy, a chemical analysis of the alloys was considered unnecessary, and the composition was based on the weights of the two metals taken. The last alloy (80% As) was rather difficult to prepare, as the temperature required for its formation caused softening of the glass; and higher alloys could not be prepared for this reason.

The alloys freeze over a range of temperature and do not have a single sharp melting point. The first thermal arrest is the beginning of the freezing range and the second is the end.

Micrographic Analysis.—Suitable pieces of the alloy, polished as described previously (*loc. cit.*), were etched with ammonium sulphide and photographed, but owing to rapid oxidation of the surfaces the photographs are not suitable for reproduction. All the alloys proved to consist of a single constituent with a certain amount of coring; in the 80% arsenic alloy, fairly large six-sided crystals were observed.

Summary.

1. Arsenic and antimony alloy in all proportions.
2. They form solid solutions but no chemical compound.
3. The alloy containing 13% of arsenic freezes at the lowest temperature.

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