

ON THE COPPER AGE IN ANCIENT CHINA. III.

By Tsurumatsu DÔNO.

Received January 13th, 1934. Published March 28th, 1934.

In the previous two reports,⁽¹⁾ the present author described the results of chemical analyses of several ancient Chinese weapons which consist of almost pure copper and concluded that the copper age and a transitional period to the well known bronze age really existed in ancient China. Quite recently the author was fortunately able to get in hand some further specimens of old Chinese weapons of the same type as already studied, by the kindfull efforts of Mr. Mikami and Mr. Sugimura in Peiping, to whom the author wishes to express his profound indebtedness on this occasion.

The newly obtained specimens consist of a spear head and three halberds (compare Figs. 1, 2, 3 and 4.), among which the spear head contains, according to the present investigation, about 0.24% of tin (too insignificant amount in tin to be taken as a bronze implement), while two halberds involve no or a very slight amount of tin, in the latter case the metal being only detectable by the spectral analysis.

As for the last one of these halberds, it showed indeed so much content of tin as 13.74% and it may properly be called a bronze implement. More-

(1) T. Dôno, this Bulletin, 7 (1932), 347; 8 (1933), 133.

over, it is of no less interest to recognise the fact that this last specimen of the high tin content is considered to possess a quite advanced form compared to the others now studied from the archæological standpoint.

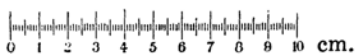
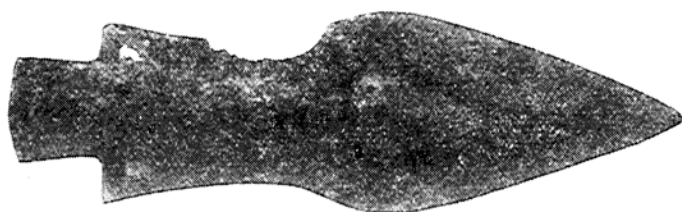


Fig. 1. Spear-head.



Fig. 2. Halberd A.



Fig. 3. Halberd B.



Fig. 4. Halberd C.

Experimental Part.

The chemical analyses and the metallographical studies were carried out in the usual way⁽²⁾ and the constituents, which are scarcely detected by the chemical methods, were found from the arc spectral analysis. The results are given below :—

Results of the chemical analysis :

| | Spear-head | Halberd A | Halberd B | Halberd C |
|--------------|------------|-----------|-----------|-----------|
| Sample (gr.) | 0.4960 | 0.5050 | 0.5007 | 0.5120 |
| Copper (%) | 84.78 | 88.14 | 85.86 | 84.92 |
| Tin (%) | 0.24 | Trace | Trace | 13.74 |
| Lead (%) | 6.02 | 6.64 | 13.05 | 0.30 |
| Arsenic (%) | Trace | — | — | Trace |
| Iron (%) | 3.65 | 0.08 | 0.06 | 0.12 |
| Nickel (%) | — | — | — | — |
| Gold (%) | Trace | Trace | Trace | Trace |
| Silver (%) | 0.06 | 0.04 | 0.05 | 0.04 |
| Total (%) | 94.75 | 94.90 | 99.02 | 99.12 |

Metallographical photographs

(2) T. Dôno, *J. Chem. Soc. Japan*, **51** (1930), 463; **53** (1932), 100.

(Enlarged 100 times and etched by the solution of ammoniacal hydrogen-peroxide).

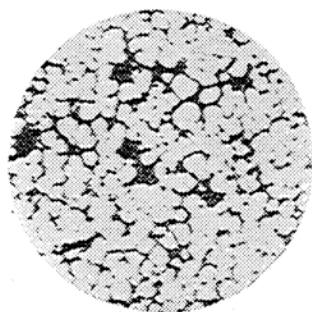


Fig. 5. Spears-head



Fig. 6. Spears-head (etched)

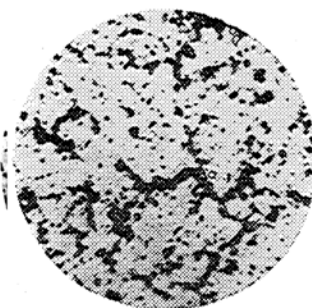


Fig. 7. Halberd A



Fig. 8. Halberd A (etched)



Fig. 9. Halberd B



Fig. 10. Halberd B (etched)

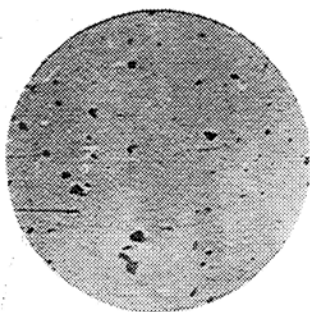


Fig. 11. Halberd C

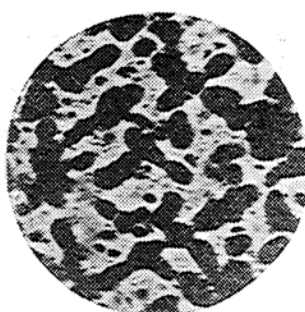


Fig. 12. Halberd C (etched)

As will be seen in the analytical results given above, some of them are considerably less than 100% in total: this is, as was stated in the previous reports,⁽¹⁾ due to oxygen which combined probably with metals during or after the manufacture of these weapons. As for the meaning of the existence of other metals also was already explained in the preceding papers.⁽¹⁾

In conclusion, the author expresses his sincere gratitude to Prof. Dr. Y. Shibata, Prof. Dr. S. Katō and Prof. Dr. K. Kimura for their kind guidances, and to Prof. Dr. Y. Harada, Dr. Y. Komai and Dr. N. Egami in the Archaeological Institute of the Faculty of Literature of Tokyo Imperial University, who gave valuable advices on the archæological consideration.

Summary.

One spear-head and three halberds which are of the same types as those relics unearthed from Yin Site, were analysed, and it was proved that the spear-head and the two of three halberds must be called the copper implements, and the last one of the halberds contains a considerable amount of tin, therefore this specimen may be called properly a bronze one.

Considered from these results coupled with those described in the previous two papers, all of four spear-heads already studied were of almost pure copper, and four of the six halberds were also pure copper implements and some others were regarded as bronze implements.

Thus, by the present investigation of the author, the existences of the copper age and a transitional period to the bronze age in ancient China were further emphasized.

Chemical Laboratory, Akita Mining College.
