

ON THE COPPER AGE IN ANCIENT CHINA. II.
(ON THE TRANSITIONAL PERIOD BETWEEN THE COPPER
AND BRONZE AGE IN ANCIENT CHINA.)

By Tsurumatsu DŌNO

Received March 15th, 1933. Published April 28th, 1933.

In the previous paper, the present author reported⁽¹⁾ the results of chemical analyses of some metallic spear-heads of ancient China, which were made of almost pure copper. These specimens studied possess very primitive appearances and seem to belong to extremely antique species closely resembling to those relics unearthed from Yin Site in Honan. By this chemical investigation, the existence of the pure copper implements in ancient China being first confirmed, the author came to the conclusion that the real presence of the copper age in China preceding probably to the well known bronze age must be considered.

Encouraged by this discovery, the author has hereafter endeavoured to search for the specimens of the same kind as those recently analysed, in order to extend his study in this side. Fortunately several halberds in the type of those unearthed in Yin Site were put at his disposal by Mr. Sugimura in Peking, to whose kindness the author is very much indebted (compare Figs. I, II and III). According to the chemical study of these new specimens by the author, it was proved that one (A) of these three halberds contains so insignificant amount of tin that the arc spectral analysis was only able to detect the presence of this metal as several very

(1) Dōno, this Bulletin, 7 (1932), 347.



Fig. 1. Specimen A



Fig. 2. Specimen B



Fig. 3. Specimen C

faint lines, and consequently this specimen must be called the pure copper implement. The second one (B) involves tin in the amount detectable by an ordinary chemical analysis, namely about 0.60%⁽²⁾: even this, however, it must be classified in the copper implement from its very low contents in tin compared with ordinary bronze. As for the last specimen (C), it showed indeed a considerably high contents of tin ($\text{Sn} = 2.19\%$) and it will undoubtedly be called a bronze implement in spite of that this is in the same type with the other two.

From the latter interesting fact, it may easily be concluded that the specimen (C) should have been manufactured in the transitional period between the copper and bronze age, and further that the copper age in ancient China existed very probably closely before the bronze age. It may also be supposed that the bronze age in ancient China should have begun at the time in which these types of halberds were made use of.

Experimental Part.

The chemical analysis as well as the metallographical study were carried out in the usual way⁽³⁾ and the constituents, which are scarcely detected by the chemical methods, were found from their so called "raies ultimes" of the arc spectra. The results are given below.

(2) This low contents in tin must not be considered that this metal was added artificially.

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

Wave-length of tin-lines	Specimen A	Specimen B	Specimen C
3175.16	doubtful	intense	intense
3262.50	"	"	"

Results of chemical
analyses

	Specimen A	Specimen B	Specimen C
Sample (gr)	0.4890	0.5016	0.5085
Copper (%)	77.20	97.60	83.85
Tin (%)	Trace	0.60	2.19
Lead (%)	15.08	0.58	5.85
Iron (%)	2.80	0.08	0.08
Arsenic (%)	—	—	Trace
Nickel (%)	0.03	0.04	—
Gold (%)	Trace	Trace	Trace
Silver (%)	0.04	0.03	0.06
Total (%)	95.15	98.93	97.03

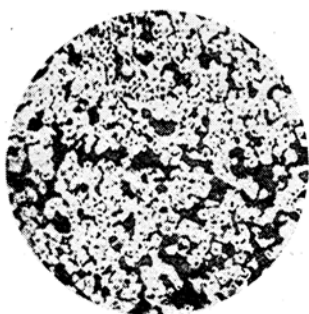


Fig. 4. Specimen A

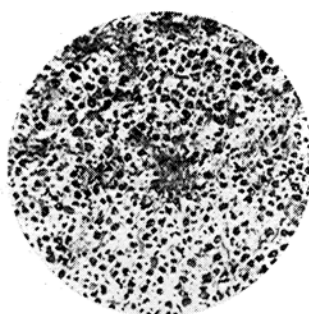


Fig. 5. Specimen A (etched)



Fig. 6. Specimen B

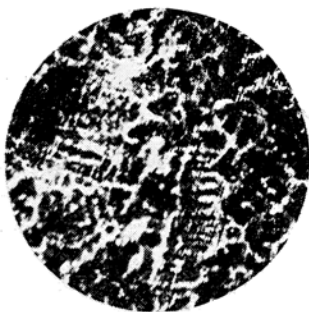


Fig. 7. Specimen B (etched)

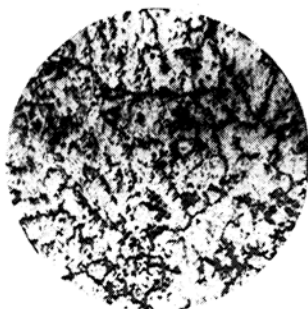


Fig. 8. Specimen C

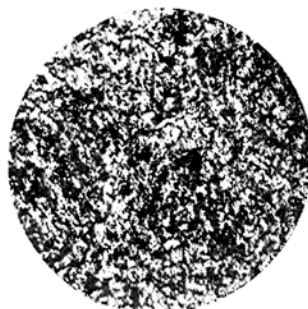


Fig. 9. Specimen C (etched)

As will be seen in the analytical results given above, the total values do not attain to 100% ; this is, as was stated in the previous paper, due to oxygen which combined probably with metals during and after the manufacture of these weapons. As for the meaning of the existence of other metals was also already explained in the preceding paper.

Thus the author could add two more examples of pure copper implements in the ancient Chinese relics and was able to strengthen the recognition of the existence of the copper age in ancient China. The fact, that one of specimens now studied was of bronze, tells us that the beginning of the bronze age may be considered to have occurred at the time in which these types of halberds were made use of.

In conclusion, the author expresses his sincere gratitude to Prof. Dr. 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 to his investigation from the standpoint of Archaeology and also to Prof. Dr. T. Mishima for the trouble of taking the metallographical photographs.

*Chemical Institute, Faculty of Science,
Imperial University of Tokyo.*
