Textual Research on Textile Measurement Based on “Pi Ma Shu Si” in Description of Hu Ding

Hongjun Liu[1,a], Bin Li[1,b], Qiang Li[1,c], Anding Liu[1,d,*], Yixiao Li[2,e,*]

[1]School of Fashion, Wuhan Textile University, No.1, Fangzhi road, Hongshan District, 430073, Wuhan, Hubei, China

[2]Academy of Arts&Design, Tsinghua University, 30 Shuangqing Road, Haidian District, 100083, Beijing, China

[a]1872687588@qq.com, [b]libin790121@qq.com, [c]liqiang800121@foxmail.com, [d]ada20040705@126.com, [e]liyixiao21@mails.tsinghua.edu.cn

*Corresponding author

Keywords: Inscription of Huding, "Pi Ma Shu Si", Textile, Measurement Units, Silk

Abstract: Many archaeologists ignored the explanation "Shu" of "Pi Ma Shu Si" in the Inscription of HuDing, it led to some mistakes and misunderstandings, thus some fallacies spread repeatedly. Based on the systematic research and analysis on textile measurement units in ancient China, this study holds that: "Shu" of "Pi Ma Shu Si" in the Inscription of HuDing is a measurement unit for fabric specifications, 1 Shu=5 Pi, which is not considered by traditional historical circles Unit of volume for binding; Xu Kai’s view on the measurement of silk in the Southern Tang Dynasty was questionable, he presented cognition problem as technology problem ;1 Liang = 1 Pi = 2 Duan = 4 Chang = 5 Xun = 40 Chi, 1 Shu=5 Pi, 1 Chun = 2 Liang or5 Liang; Character "Zhang" in some Chinese Song Poems,for example"Jiu Zhang Ji", "Bai Zhang Ji" and "Si Zhang Ji" is not a measurement unit for fabric specification, but means "operating weaving machin". In addition, the modernity interpretation of the ancient fabric precision unit "Sheng" is carried out in order to better carry forward the ancient Chinese textile culture.

1. Introduction

Hu ding is a bronze ware in the middle of the Western Zhou Dynasty. It was handed down in the Qianlong period of the Qing Dynasty and its whereabouts are unknown. There are only a few rubbings of inscriptions and a few words and phrases about its shape and structure described in "Jin Shi Cui Bian", "Ji Gu Zhai Zhong Ding Yi Qi Kuan Shi" and other works of the stone monographs. Even so, the contents of the Inscription of Hu Ding 's rubbings have become a rare precious material for studying the social, political, and economic conditions in the middle of the Western Zhou Dynasty. Inscription of Hu Ding describes three things, in which the inscription of "Pi Ma Shu Si Huan Wu Fu" (many people believe that "Fu" refers to slaves) has become the "ironclad proof" in China from basic education to higher education, which proved that slaves were the main labor force in the slave society and they lived miserably. Even some educational books show this hard evidence in the form of pictures (Figure 1), which convinced the educated men (including the former author). In addition, this view on the Internet is also popular, it seems to become an unalterable statement. Based on the "Shu" measurement of silk in "Pi Ma Shu Si" in the Description of Hu Ding and a reasonable interpretation of the relevant inscriptions, this article questions the use of "Pi Ma Shu Si Huan Wu Ge Nu Li" evidence and draws the conclusion that the silk fabric of the Chinese slave society is very expensive and the labor price is more expensive. At the same time, the author believes that the lack of research on Chinese textile measurement system is an important reason for the misjudgment of the traditional view of "Pi Ma Shu Si", and it is necessary to systematically sort out the measurement of ancient Chinese textiles.

  DOI: 10.25236/eeha.2024.006

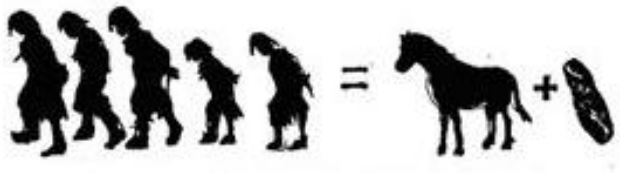

Figure.1 The picture image of “Pi Ma Shu Si Huan Wu Fu” in some relative history textbooks.

2. New Explanation of "Shu" and "Si" in "Pi Ma Shu Si" in Inscription of HuDing

From the parallel structure of "Pi Ma" and "Shu Si" in "Pi Ma Shu Si" in Inscription of Hu Ding, "Shu" refers to the unit of measurement, which corresponds to Pi; Si" refers to an item, corresponding to Ma. Therefore, traditional historians believe that the meaning of "Shu" and "Si" in the inscription is "a bundle" and "silk" respectively, otherwise it would not be represented by figure 1. However, the author believes that this point of view is questionable for three reasons: (1) The view of the traditional historical circles is that there is a mismatch between objects and units of measurement. Traditional historical circles thinks that "Si" of "Pi Ma Shu Si" in the inscription of Hu Ding refers to silk, which is also explained in "Shuo Wen Jei zi" written in the Eastern Han Dynasty, and the "Shu" here is traditionally considered to be a volume unit for bundling, and within a bundle is a unit of volume with great elasticity, because there is a problem with the strength of compressed silk and a big artificial factor, and more than two bundles is a problem of coexistence of bundle and volume. How can silk be measured in volume units here? Since there are relevant records in Chinese literature, weight units are used for the measurement of silkworm cocoons, raw silk, and cooked silk, because volume units vary greatly due to the size of the compressive force. In the Western Zhou Dynasty, when silk was exchanged with other things, if the silk is used to measure the volume unit, it will be affected by many human factors. In order to avoid disputes, it should not be used. The author consulted the history of Chinese measurement and found that the volume units of the pre-Qin period were "Yi", "Ju", "Yu", "Sheng", "Dou", "Ou", "Fu", "Zhong", "Gu", "Pen", etc. and the weight units have "Dan", "Jun", "Zhu", "Yi", "Liang", "Shu", "Lei", etc., but the measurement unit "Shu" has not been found in both measurement units [1].

(2) Examining ancient Chinese books, "Shu" refers to the unit of measurement for textiles, and 5 Pi equals 1 Shu, which cannot be matched with the original "Silk" of "Si". "Shu" can only be matched with textiles. For example, "Shabo" appearing in "Biography about King Mu" [2], the unit of Bo (silk) is Pi, and Shu is to tie 5 Pi silk together. Then the "Si" of "Pi Ma Shu Si" in the Inscription of Hu Ding should refer to silk fabrics. This usage can be seen in “the Ancient poetry for Jiao Zhong qing’s wife ”(also known as “the Peacock Flying Southeast”), written in the southern New Ode to Yuta in the late eastern Han dynasty: "she wore silk shoes and the Hawksbill hair clasp on her head sparkled." Another problem, however, was that the "Shu Si" collocation was not found in other western Zhou inscriptions and related literature, which led author to doubt whether the "Shu Si" collocation was reasonable, and then to doubt the authenticity of the Inscription of Hu Ding and even Hu Ding. However, bronzes such as Hu Zun and Xiao You were discovered in Yun tang, Fu feng County, Shanxi Province in 1976 [3]. “Hu” and “Xiao” are the characters contained in the inscriptions, and the records and extensions of the inscriptions of the Ding have existed as early as the Qianlong period of the Qing Dynasty. It can be seen that the rubbings of Inscription of Hu Ding cannot be faked, thus proving the authenticity of Hu Ding.The Inscription of Hu Ding is a reliable, but the expression of "Shu Si" is different from "Shu Bo" in Biography about King Mu, which was written in the Western Zhou Dynasty during the Warring States Period. The author thinks that the name of "Shu Si" (five pieces of textiles) appears earlier than that of "Shu Bo" (five pieces of silk) for two reasons: ① "Biography about King Mu" is a story about the Western Zhou Dynasty written by the Warring States, which inevitably takes with it the history of Whig of "standing in the position and background of modern people, looking at things happening in ancient times". "Shu Bo" was mostly used as an appellation for people in the Warring States Period, and was imposed to the people of western Zhou. ② The order of using "Shu Si" and "Shu Bo" indicates

that the variety of silk fabrics in the Warring States period has increased a lot compared with the Western Zhou Dynasty, because Bo is one kind of silk fabric, and “Si” is a general reference for silk fabric.

(3)The overall text of the paragraph where "Pi Ma Shu Si" is located proves that "Wu Fu" is expensive, and infers that silk fabrics are also expensive. It also proves that the "Wu Pi" of "Shu" is correct. To verify the text, first choice is more reliable and correct annotations. There are a lot of annotations in the rubbings of inscriptions, which are roughly the same except for individual words, but even those differences are closely related to the content examined in this article. On the one hand, the author chooses the explanation made by Mr. Li based on the inscription rubbings collected by Sichuan provincial museum, but has doubts about the explanation given by Mr. Xie [4]. On the other hand, the author selects Mr. Wang's interpretation of annotations, but has some doubts about the annotations adopted by Mr. Guo [5]. There are two reasons: ① In Mr. Guo's annotations, after the word "Pi Ma Shu Si", there is also the silk weight measurement information "Si San Lue", so the author wants to ask, since silk is measured in weight units, why use "Shu Si" in the previous article? Obviously, there are logical contradictions here. However, Mr. Li's annotations to Mr. Guo's "Si San Lue" is "Zi San Lue", and "Zi" means remuneration, which obviously does not conflict with "Pi Ma Shu Si". ② In the paragraph of the " Pi Ma Shu Si " is noble Hu gives wine, sheep, remuneration to Wu Fu, or Hu’s subordinates gives Hu wine, sheep, remuneration. This is a key issue. The author agrees with Mr. Wang's point of view: "Wu Fu" is not a slave; it should be Meng (author's note: at the time it meant tenants). From the perspective of the overall text, Wu Fu turned away from Hu and went to Xiao Fu for some unknown reasons. In order to settle the matter privately, Hu is willing to exchange Pi Ma Shu Si for Wu Fu. However, Xian failed to fulfill the agreement twice with Xiao Fu, with intentions of extortion and difficulty. The Western Zhou law stipulated that the peasants should not betray their master and turn to others, which caused a lawsuit. If Wu Fu is a slave, it is not a big deal. Why write it on a weight apparatus like Da Ding (Tripod)? Meng was a very important labor force in the Western Zhou Dynasty, and had a certain social status, otherwise, they will not be given condolences to them with wine, sheep and fee, so that they will no longer be lured away by Xiao Fu. In addition, "Shu Si" is a five-pi silk fabric. Silk fabrics are very valuable in the Western Zhou Dynasty. Because silk fabric production has experienced an extremely complicated process, silk fabric was used only on the great day of the sacrifice to the gods, to the ancestors of Kings and nobles, and to themselves [6], and the five slaves cannot be compared with silk fabrics. In this way, the value of Wu Fu is very expensive. Conversely, judging from the price given by Hu "Pi Ma Shu Si" equal to "Wu Fu", if "Shu Si" is the traditional view of "A bundle of silk", then how to accurately reflect the value of Five Fu.Only when "Shu Si" is regarded as "five Pi silk fabrics" can Wu Fu's value be reflected.

As can be seen from the above three points, Figure 1 conveys the wrong message, and it should be a horse plus five silk fabric equals five Meng.

3. Questions and Supplements of Ancient Chinese Testile Metric

3.1. Questions on real Silk metric proposed by xu kai in the southern tang dynasty

The author holds a questionable view on the metric theory that " The thing that a silkworm vomits is called 'Hu'; Ten 'Hu' is silk; 'Mi' is five 'Hu' " proposed by Xu kai (AD 920-974), an exegesis expert in the southern Tang dynasty. According to the astrology "Sun Zi Suan Jing" in the southern and northern dynasties, the earliest record about measuring "Hu" is recorded: " A silkworm spins silk to form one 'hu'; ten 'hu' make one 'miao'; ten 'miao' make one 'hao'; ten 'hao' make one 'li'; and ten 'li' make one 'fen' ". There is no expression of " Ten 'Hu' is 'Si'; 'Mi' is five 'Hu' ". However, in volume 14 of Wu Deng Hui Yuan, a book written after Xu kai in the southern Song dynasty contains "Mu Ren Mi Yun Hua Ji, Si Hao Bu Shuang.Shi Nv Quan Ti Kong Yin, Wen Cai Wei Zhang". Obviously, the diameter of a silk is used as a unit of measurement of length. The author believes that "Wu Deng Hui Yuan" may be affected by Xu Kai's discussion, and even idiom "Si Hao Bu Cha" and "Si Hao Bu Shuang" (Describe minimal or very small, not lacking at all)

are all affected by Xu Kai's exegesis. ②the interpretation of "Si" and "Mi" in "Shuo Wen Jei Zi" written earlier than the time when Xu Kai lived was "Si, is the silk that the silkworm spits out" "Mi, is the filament", which does not seem to be discussed by Xu Kai. The author here believes that Xu Kai only supplements and explains based on his own knowledge. The Southern Tang Dynasty was more stable and economically prosperous than other regions during the Five Dynasties and Ten Kingdoms period. The silk weaving industry was unprecedentedly developed. It is conceivable that Xu Kai must had seen the silk reeling of the southern reeling car. The silk extracted from the cocoon is a number of cocoon filaments and twisted together. Xu kai might mistakenly refer to the problem of cognition as a technological problem. But Xu Kai's words is meaningful. It can be used as an indirect evidence to prove that there was a Nanzhi car during the Five Dynasties and Ten Kingdoms. ③Textual Research on the image information of oracle Bone Inscriptions's "Si" and "Mi" found that "Si" and "Mi" may be pictographic expressions of cocoon silk, silk and single fiber respectively, which is easy to find that as long as the cocoon silk is fully soaked in water, otherwise, why else wouldn't oracle have formed a text image of a cocoon silk in the form of three or four single fiber images?[7]

3.2. Supplement and reconsideration of fabric measurement

The measurement of the fabric is the specification, and the unified specification is convenient for taxation and merchandise trade. From the "Bao Bu Mao Si" in the "Book of Songs" written in the Spring and Autumn Period, we can see the exchange of cloth with silk, but this exchange must have certain specifications, otherwise this exchange cannot be carried out smoothly. "Zuo Zhuan", written at the same period, also recorded: " Just as cloth has its limits, it should be regulated", so there is "Wu Qi asked his wife to weave the tape, but because the width of the tape woven by his wife was too narrow to fit the production system, Wu Qi was very angry and abandoned his wife. " The specifications of fabrics are commonly used as "Pi", but Pi changes slightly in different historical periods, as shown in Table 1 [8]. The reason for the great changes in the width, especially during the Ming and Qing dynasties, was mainly due to the progress of the loom, and even a loom that could be woven by two people. At the same time, the length of the fabric measurement unit "Pi" during the Ming and Qing Dynasties also changed. The author believes that there may be two reasons: ① With the development of feudal commodity economy, plenty of powerful textile regional economy have emerged in various regions, such as Jiangsu, Zhejiang and Sichuan and so on, but their lengths and widths are various in different textile economic zones, which may be related to the production habits and market consumption habits. ② The length of Pi may also be related to the commercialization of transportation in the Ming and Qing Dynasties. The volume of textile transportation is closely related to its cost. If according to the regulation of late Zhou in Five Dynasties , the volume of 1 Pi silk fabric is visibly smaller than the volume of 1 Pi hemp fabric and cotton fabric, but all three have the same Pi Xin (the wooden board that surrounds the textile), so from an economic perspective, it is obvious that the cost of silk transportation is higher. In order to save cost in transportation, In ancient times the length of a piece of silk was allowed to be slightly longer than that of a piece of cotton or hemp, so that the volume of 1 pi silk, cotton and hemp were the same, which would save a lot of costs in large-quantity cargoes transportation. Meanwhile, the length of Pi in Ming and Qing dynasties might be related to the operation of different firms.

After confirming the fabric measurement of the "Pi", there is a very specific concept for people to see other fabric measurement units based on "Pi". However, it is very regrettable that the comments on textile measurement in ancient Chinese classics are diverse, which leads to confusion. But the author holds that it is possible to prove the positive evidence and negative evidence according to the measurement of the relevant Pi that has been proved by archaeological discovery (table 1) and the same measurement annotated by various scholars. In addition, it should be made clear that Liang, Chi, Xun, Zhang and Duan in the following paragraphs are all area units, with the same width and length indicating the area: 1) Firstly, the conclusion of the theorem should be determined: ①All parties agree that 1 Liang = 40 Chi = 5 Xun; ②The measurement system determines that 1 Zhang = 10 Chi; ③it is said that 1 Pi equals to 4 Zhang or 8 Zhang. According to

the equation of ②, the author takes 1 Chi = 23 cm as the basis of the Han-Wei period. (The textbooks related to textile measurement are mostly pre-Qin documents, and most of the pre-Qin documents are organized by the Han people, so the measurement of the Han and Wei period is appropriate) ,so 1Pi = 9.2 m (4 Zhang) or 18.4 m (8 Zhang). Because the relevant data in Table 1 has been verified by Zhao Feng 's archaeology, this paper believes that 1Pi = 4 Zhang = 9.2 m is credible; ④ 1 Shu = 5 Pi.

Table.1 The transformation of measurement unit “Pi” in Chinese history.

Period	Width		Length	
	Ancient Name	Converted into current system	Ancient Name	Converted into current system
Han and Wei Dynasties	2 Chi 2 Cun (1Chi＝23 cm)	50.6 cm	40 Chi	9.2 m
Tang dynasty	1 Chi 8 Cun (1 Chi＝30 cm)	54 cm	4 Chang	12 m
Late Zhou in Five Dynasties	2 Chi 5 Fen (There were two types of rulers in the Tang and Song Dynasties, one was slightly larger, called Da Chi; the other was slightly smaller, called Xiao Chi)	Similar to the Tang dynasty system	42 Chi	Similar to the Tang dynasty system
Ming and Qing Dynasties	2 Chi up and down, even to about 1 m (1 Chi＝31 cm)	62 cm, even to about 1 m	4 Chang, 5 Chang ranging or longer	12.4 m, 15.5 m ranging or longer

2) Secondly, the author denies some textile metrics through reduction to absurdity.

①Related literature has the conclusion that 1 Duan = 2 Zhang or 6 Zhang or 1 Zhang 8 Chi.

Assuming that 1 Duan = 2 Zhang is correct, 1 Pi = 2 Duan (that is, 1 Shu = 10 Duan) can be obtained from the known 1 Pi = 4 Zhang. In terms of conversion, the ancients could only use integers, otherwise there would be a lot of trouble. Thus, it is possible that 1 Duan = 2 Zhang.

Assuming that 1 Duan = 6 Zhang is correct, 1 Pi = 2 / 3 Duan is obtained from the known 1 Pi = 4 Zhang, because this conversion is not an integer, the assumption is not true.

Assuming that 1 Duan = 1 Zhang 8 Chi is correct, it is known that 1 Pi = 4 Zhang and we get 1 Pi = 20 / 9 Duan, because this conversion is also a non-integer, the assumption is not true.

In summary, there must be a conversion, so 1 Duan = 2 Zhang is correct.

②Related literature has the conclusion that 1 Pi = 2 Liang or 1 Liang.

Assuming that 1 Pi = 2 Liang is correct, it is known that 1 Liang = 40 Chi and 1 Zhang = 10 Chi and we get 1 Pi = 8 Zhang. It has been proved that 1 Pi = 8 Zhang is wrong, so 1 Pi = 2 Liang is incorrect.

Assuming that 1 Pi = 1 Liang is correct, it is known that 1 Liang = 40 Chi and 1 Zhang = 10 Chi and we get 1 Pi = 4 Zhang. It has been proved that 1 Pi = 4 Zhang is correct, so 1 Pi = 1 Liang is correct.

In summary, 1 Pi = 1 Liang is correct.

3) From the above, it can be obtained that 1 Liang = 40 Chi, 1 Duan = 2 Zhang, 1 Zhang = 10 Chi, 1 Liang = 2 Duan.

4) another explanation and two counterevidence will be made as follows. The relevant literature is 1 Chun = 2.2 Chi or 5 Pi or 4 Duan.

A note: 1 Chun = 2.2 Chi is originated from "show the (standard) unit of length, unit of capacity, width of cloth and length of piece"written in "Zhou Li · Tian Guan · Nei Zai". Zheng Xuannoted that: So write" Chun "as" Dun ", Du Zichun reads" Dun "as" Chun ". Chun refers to the width, and

system refers to the length of Pi. The author would like to ask here, if Chun is the width, then 2 Chun3 Chun ... where is it used? Are there many mill types with wide widths in the Western Zhou Dynasty? It is obviously impossible. Thus, Zheng Xuan's explanation is wrong.

Two counterevidence: ①Assuming that 1 Chun = 5 Pi, then 1 Pi = 1 Liang = 4 Zhang = 40 Chi gives 1Chun = 5Liang, converted to an integer, which may be correct. ②Assuming that 1 Chun = 4 Duan, then 1 Liang = 2 Duan gives 1 Chun = 2 Liang, and the conversion is also an integer, which may be correct.

In summary, the author can deduce the fabric metric: 1 Liang = 1 Pi = 2 Duan = 4 Zhang = 5 Xun = 40 Chi, 1 Shu = 5 Pi, 1 Chun = 2 Liang or 5 Liang. In addition, during the Wei and Tang dynasties, there was once a specification of "Zhang". According to the documents of Turpan, a specification was about eight feet to ten feet in length and four to five feet in width, which was about 2 m in length and 1 m in width today and popular in central Asia. It was later used in the mainland. The author needs to clarify that "Zhang" in Song Ci "Jiu Zhang Ji" is not a fabric specification for two reasons: ① The usage of "Zhang" was popular in the Wei and Tang Dynasties, not in the Song Dynasty. ②If “Zhang” is the unit of measurement in this article, how big should be the loom that can weave 9 Zhang fabric? Even after he wrote the work "Bai Zhang Ji", the entire loom was bigger than the pyramid. Obviously "Zhang" in Song Ci is not a unit of measurement for fabrics. ③ "Zhang" in Ci should mean the operation, and "Ji" means the loom. Ji Zhang Ji refers to operate the loom several times.

3.3. The modern characterization of the expression of ancient fabric precision

For "Sheng" in "Mourning Apparel", Zheng Xuan explained that "1 Sheng is equivalent to 80 Lv". In fact, Sheng is an ancient unit for warp density. 1 Sheng means that there are 80 warp yarns in the width of the fabric. Take the width of 50.60 cm as an example, 1 Sheng = 1.58 Gen / cm, then the warp density of 15 Sheng cloth is 1.58 × 15 = 23.70 Gen / cm, and the warp density of 30 Sheng cloth = 1.58 × 30 = 47.40 Gen / cm, which can be seen that 30 Sheng cloth is already very fine. The author's conversion of the precision degree of each mourning in “Mourning Apparel” is shown in table 2.

Table.2 The mourning objects, quantum of “Sheng” and warp density of all kinds of mourning apparel in Chapter Mourning Apparel of Ceremony

Mourning name	Mourning object	Quantity of cloth needed (Unit: Sheng)	warp density (Geng·cm-1)
Zhan Cui	parents	3	4.74
Zi Cui	grandparents	4～6	6.32～9.48
Da Gong	brothers and sisters	7～9	11.06～14.22
Xiao Gong	Parental relatives	10～12	15.80～18.96
Si Ma	Distant relatives	7	11.06

4. Conclusion

Through a comprehensive study of "Pi Ma Shu Si" in the Inscription of Hu Ding and a systematic arrangement and analysis of ancient Chinese textile metrics, the author agrees that: 1) "Shu" of "Pi Ma Shu Si" in the Inscription of Hu Ding is a measure of fabric specifications. and 1 Shu = 5 Pi is a unit of binding volume considered by non-traditional historical circles; 2) The traditional view of "Pi Ma Shu Si" is wrong as the so-called "ironclad proof" of the tragic slave life in Chinese slave society, "Pi Ma Shu Si Huan Wu Fu", on the contrary, proved the preciousness of silk and the labor force ——the importance and value of Meng in the society at that time; 3) it is problematic that the silk measurement mentioned by Xu Kai in the Southern Tang Dynasty. He described the problem of knowledge as a problem of technology, so his relevant conclusions are not credible; 4) this paper makes a positive and negative inference on ancient Chinese textile metrics

respectively, and draws the conclusion that 1 Liang = 1 Pi = 2 Duan = 4 Zhang = 5 Xun = 40 Chi, 1 Shu = 5 Pi, 1 Chu = 2 Liang or 5 Liang; 5) The "Zhang" of "Jiu Zhang Ji", "Bai Zhang Ji" and "Si Zhang Ji" in literary works is not a fabric specification unit but a meaning of operating a loom; 6) The modernity interpretation of the ancient fabric precision unit "Sheng", aims to better promote the ancient Chinese textile culture, and "Sheng" is also an important symbol that reflects the quality of ancient textiles. "Pi Ma Shu Si" in Inscription of Hu Ding only has the measurement information of the number of fabrics, but lacks the measurement information of the degree of precision, which is also regretful.

References

[1] Qiu, G.M., Qiu, L., Yang, P., The History of Science and Technology in China · Measurement Volume, Science Press,Beijing, 2011, 25-38.

[2] Wang, T.H., The Full Translation of the Biography of the King Mu of Zhou · The Full Translation of the Biography of the Prince Dan of Yan, Guizhou People Press, Guiyang, 1997, 12, 105.

[3] Li, H., The Textual Research of You-Shou Calligraphy HuDing Inscription Excerpts and Explanations, In:Journal of Qiqihar University: Philosophy & Social Science, 2013,3,50-52.

[4] Xie, L., The Precious Rubbing: the Inscription of HuDing, In:Sichuan Cultural Relics, 2002,4, 45-47.

[5] Wang, D.P., The Research on the Inscription of HuDing, In:Tianjin Social Sciences, 1984,6, 71-72, 35.

[6] Li, Q., Yang, X.M., A Study of butterfly effect in social history of textile technology, In:Journal of Shanxi University: Philosophy & Social Science, 2011,2,13-17.

[7] Li, Q., Li, B., Li, J.Q., Study on textile technology and culture in the oracle bone inscriptions, In: Journal of Wuhan Textile University, 2014,1, 19-22.

[8] Zhao, F., A History of Chinese Silk Art[M]. Cultural Relics Press, Beijing, 2005, 34-35.