

“The Analyses of Plain and Red-painted Polished Korean Pottery Sherds Excavated at Yangp’yōng-ni, Chewōn-gun County, Ch’ungch’ōng Pukto Province”

—A Study of the Nam-Han River Valley Culture (2)—

Mong-Lyong Choi*

I. Preface

The Five samples analyzed here can be divided into two groups of pottery sherds; one is a traditional plain (or plain coarse) pottery and the other is a red-painted polished pottery (traditionally called ‘Tand-omayōn Togi’, but now called ‘Hongdo’, a term coined by Wōn-yong Kim). Both types of pottery came from the subterranean settlement excavated at Yangp’yōng-ni, Chewōn-gun county, Ch’ungch’ōng Pukto province, and they are believed to be included within the same period of the Plain pottery culture’ (Kim, C.H., 1978:53), or the Bronze Age I (1,000 or around 700 B.C. to 300 B.C.) in terms of the Prehistoric chronology of Korea established by Wōn-yong Kim (1977):

“... from around 1,000 B.C. new types of pottery emerged in northwestern Korea. They vary in details, but a common feature is the plain surface without ornamentation, and accordingly they are collectively called as the Plain pottery.” (Kim, W.Y., 1981:30)

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According to Chōng-hak Kim, this association of these types of pottery is common on sites such as Yōksam-dong and Karak-ni from the north to the south of the Korean peninsula. During the Middle of the Plain pottery culture the Karak-ni type of pottery with 'the doubled over rim' is characteristic (Kim, C.H., 1978:113-114).

The red-painted polished pottery (*Hongdo*) is believed to be fired with fine paste and oxidized iron pigment on the surface for the red colored surface treatment. This characteristic pottery during the Plain pottery culture or Bronze Age in Korea is believed to have been used as a ceremonial vessel or as a burial good in the dolmen burial system because of its unusual feature, but recently these concepts are changing because it has been discovered not only from the inside of dolmen but also from settlements such as Hūnam-ni in Kyōnggi-do province (Kim, W.Y. et al, 1977:98) and Daep'yōng-ni in Chingyang-gun county (An, 1977:52).

In this small paper, I am going to analyse those five samples with the mentioned historical background using such scientific methods as Petrographic analysis, X-ray diffraction, Emission spectrographic analysis and the Scanning Electron Microscope, and then, to compare some results gained from these analyses with the previous one done by author to the samples from Yōngsan River Valley region. (Choi, 1981); finally, I am going to conclude that there was a hypothesis about common technique of pottery making in the Bronze Age I and Bronze Age II (300 B.C.~0).

The samples analyzed here are as follows;

Samples Analyzed

Sample Nos.	Kind	Color	Part
1.	red-painted polished pottery	red	body
2.	plain pottery	reddish brown	body

3.	red-painted polished pottery	red	body
4.	plain pottery	reddish brown	body
5.	plain pottery	reddish brown	body

II. Dating of the excavated settlement

This subterranean settlement (dwelling pit) had been excavated during the Summer season of 1982 by the Seoul National University under the auspices of Ch'ungch'ōng Pukto provincial office (Choi and Im, 1982). This excavation had been held at the flat alluvial place formed near Nam-Han (South-Han) River located at Yangp'yōng-ni, Chewōn-gun county which will be submerged by 1985 with the construction of dam (Fig. 1).

This settlement is 6×4m forming a long oval shape and having one fireplace inside the wall (Fig. 2). This house has produced a lot of utensils such as stone arrowheads, net-sinkers and other stone implements in addition to plain pottery and red-painted polished pottery sherds. According to the typology of pottery and stone implements, authors had assumed that the date of this house will be around 7-5 century B.C., namely during the Bronze Age I period (Choi and Im, 1983). The most important thing is the charcoal collected from the inside of fireplace located near the southern wall. As shown on the carbon age determination done by Geochron Laboratories Divison of Krueger Enterprises, Inc. in Cambridge Massachusettes (see Radiocarbon Age Determination), the charcoal sample produces the date of 2,785±165 B.P. (835±165 B.C. 1000~670 B.C.) which means that this house has existed around 7 century B.C. at least.

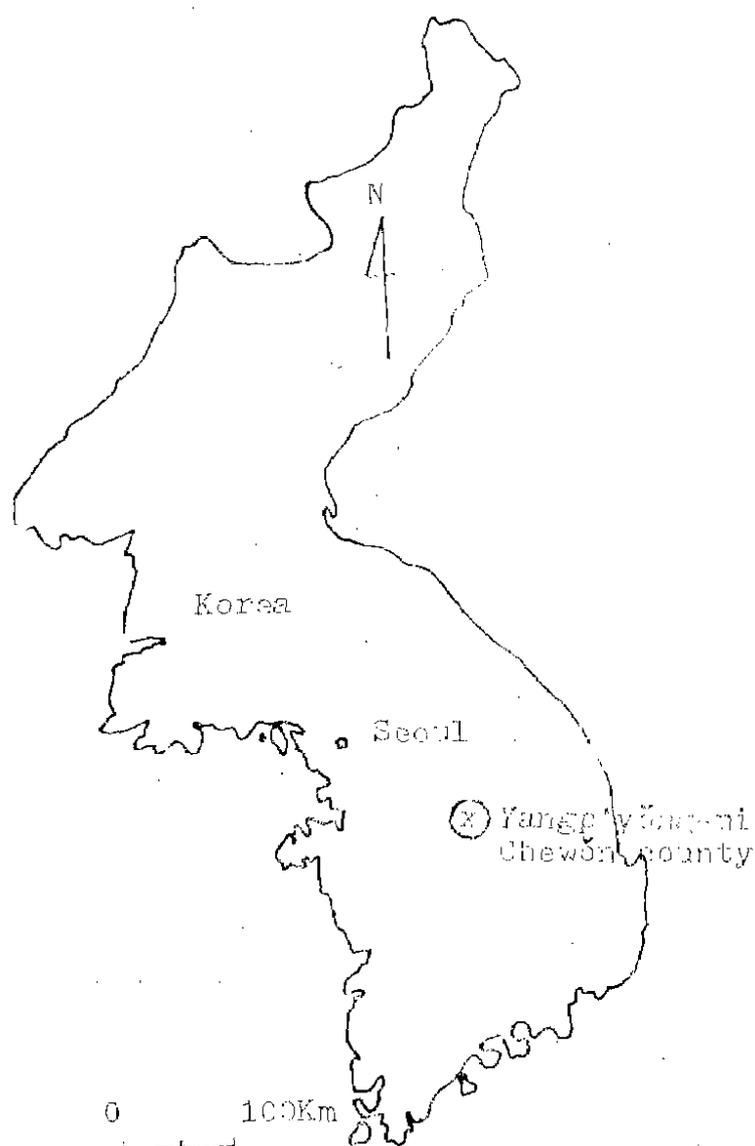


Fig. 1. Settlement site (mark × on the map) excavated at Yangp'yōng-ni Chewōn-gun county, Ch'ungch'ōng Pukto province.

This figure supports our estimation of the date of this house and the artefacts found inside this house.

III. Analyses

a. Petrographic analysis

This analysis is based on standard petrographic investigation of a suite of thin sections of pottery fragments. All sections are composed

of an assemblage of mineral grains and rock fragments, enclosed in a matrix of clay minerals such as montmollionite, small mineral fragments and black organic material. The following table (Table 1) shows that quartz, micloline, plagioclase, feldspar, oxybiotite, mafic minerals,

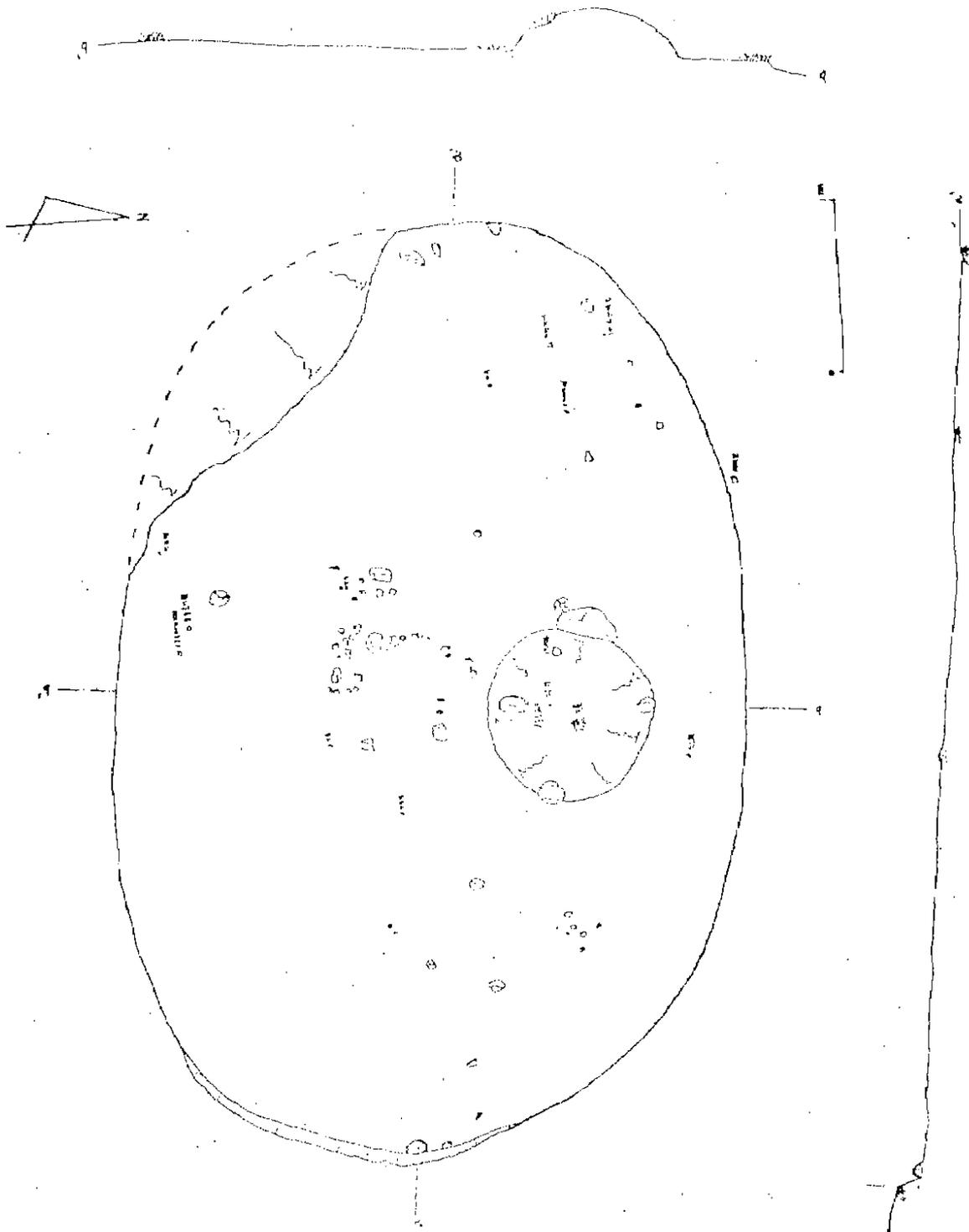
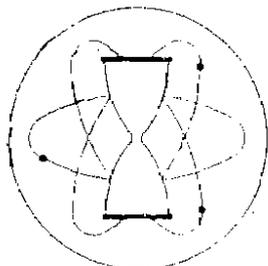


Fig. 2. The plan of settlement excavated at Yangp'yong-ni, Chewon-gun county, Ch'ungch'ong Pukto province. From Choi and Im, 1982 : Fig. 8.



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RADIOCARBON AGE DETERMINATION

REPORT OF ANALYTICAL WORK

Our Sample No. GX- 9079

Date Received: 09-23-82

Your Reference: Hand-delivered on 09-23-8

Date Reported: 11-05-82

Submitted by: Mong-Iyong Choi
Apt. #2
373 Somerville Ave.
Somerville, MA 02143

Sample Name: Yongp'yong-ni, Chawon-gun county, Ch'ungch'ch'ng provin
Korea. Charcoal from "fireplace"

AGE = 2785 \pm 165 C-14 years B.P.

Description: Sample of wood charcoal.

Pretreatment: The charcoal fragments were separated from any sand, silt, rootlets, or other foreign matter. The sample was then treated with hot dilute HCl and with hot dilute NaOH to remove carbonates and organic contaminants. After washing and drying, the charcoal was then combusted to carbon dioxide for the analysis.

Comment:

$\delta C_{PDB}^{13} =$ ‰

Notes: This date is based upon the Libby half life (5570 years) for C¹⁴. The error stated is $\pm 1 \sigma$ as judged by the analytical data alone. Our modern standard is 95% of the activity of N.B.S. Oxalic Acid.

The age is referenced to the year A.D. 1950.

mica and zircon are major constituents among which quartz and feldspar are the most important. According to this analysis, the most interesting result is that the proportion of quartz to feldspar in the plain pottery is 59:41 (no.2), 34:64 (no.4), but the unusual proportion of 94:6 (no.1) and 93:7 (no.3). These results can be supported by the proportion of plain pottery discovered from the Yōngsan River Valley Region (Choi, 1981:264). They are 60:40, 35:65, 40:60, 75:25, 60:40 and 65:35 (Table 2). In terms of this results, I am able to get a idea about the making of pottery. In case of making plain pottery, the

Table 1. The results of Petrographic analysis

	Red-painted polished pottery 1	Plain Pottery 2	Red-painted polished pottery 3	Plain pottery 4	Plain Pottery 5
Matrix %	80	75	90	95	70
Other constituents	20	25	10	5	30
Grain size of other constituents	fine	coarse	fine	medium	coarse
<i>All Rock Fragments</i>	9	2	55	40	29
Volcanic	3	2	—	5	20
Sedimentary/Metamorphic	6	tr	55	35	9
<i>All Mineral Grains</i>	91	98	45	60	71
Quartz	80	55	40	50	25
Microcline	—	40	—	—	40
Plagioclase	5	3	—	—	5
Undifferentiated feldspars	—	—	3	5	—
Oxybiotite	tr	tr	—	tr	1
Mafic minerals	3	—	2	—	—
White mica	3	—	2	—	—
Zircon-	tr	—	—	—	tr
Proportion of Quartz to Feldspar	94:6	59:41	93:7	91:9	36:64

Table 2. The Results of Petrographic Analysis (From Choi M.L., 1981: 264): Songam-dong, Uch'i-dong and Ch'unghyo-dong are all included in Kwangju city.

	Könsan-ni, Chang-hŭng (bottom)	Songam- dong (body)	Uch'i- dong (bottom)	Ch'ung- hyo-dong (body)	Ch'ung- hyo-dong (bottom)	Songam- dong (bottom)
Quartzite	trace	trace	—	—	—	—
Pegmatite		check	—	—	—	—
Rutile	large oval 3 small	streamers	trace	trace	trace	3%
Graphic	20%	9%		1%		
Plagioclase	2%	10%	15%	5%	15%	15%
Perthite			—		—	
Twin with Quartz replace			—		—	—
Pyroxene	—	—	—	—	—	10%
Pyroxene window twin	—		—	—	—	—
Quartz	60%	35%	40%	75%	60%	55%
Alkaline Feldspar	35%	50%	45%	15%	25%	5%
Nephline	—	—	—	—	—	2%
Muscovite	—	—	—	—	—	2%
Serpentine	—	—	—	—	—	5%
microcline	—	—	—	—	—	
Proportion of Quartz to Feldspar	60:40	35:65	40:60	75:25	60:40	65:35

reasonable proportion of quartz to feldspar should be kept in general, but quartz is a dominant constituent in the making of red-painted polished pottery when compared proportion of plain pottery.

Another result gained from the petrographic analysis is to confirm of the existence of the undulose quartz or alpha-quartz among the major constituents which means that both types of pottery were fired below the 573°C at most, similar to the firing condition of the plain from the

Yöngsan River Valley.

b. X-ray diffraction

Three samples were analyzed by the X-ray (powder) diffraction method. The results are as follows;

- No. 1. red-painted polished pottery: Only lines for alpha-quartz (SiO_2) were present in the pattern.
- No. 4. plain pottery: most of the lines in the film are due to a alpha-quartz (SiO_2). The two other relatively strong lines in the film (at 4.45 Å and 2.58 Å) are probably due to montmorillonite. Unoriented mounts of montmorillonite frequently give only one line at about 4.5 Å. A few additional very weak lines in the film could not be assigned to specific mineral phases.
- No. 5. plain pottery: Most of the lines are due to alpha-quartz (SiO_2). Some of the other generally weak and diffused lines in the pattern may be due to a muscovite 1M type mica mineral (such as illite). A few other very weak lines could not be assigned to specific phases. Montmorillonite does not appear to be present in the sample.

In terms of these results, we can recognize again that both types of pottery were fired below 573°C at most. The existence of alpha-quartz supports this firing condition well. And next the paste used for making plain pottery was a montmorillonite like the one of the plain pottery from the Yöngsan River Valley.

c. Emission spectrographic analyses

No differences were found in the qualitative elemental analyses between the three samples. Elements detected and their estimated ranges of concentration are as follows:

Si, Al: much greater than 0.2% by weight

Fe, Ca: greater than 0.2% by weight

Ti : approximately 0.2% by weight

Mn, Mg, Ba, Na, Zr: 0.02-0.2% by weight

Cd, Ni, Y, V, Cr, Sb: 0.002-0.02% by weight

The analyses show that 16 elements existed in the each sample as major and minor trace elements similar to the one from the Yöngsan River Valley Region (Choi, 1981:366)

d. Scanning Electron Microscope

It is necessary to use Scanning Electron Microscope to check out surface topography of pottery sherds and firing condition. Recently Kingery's method of reheating pottery samples is well used for finding firing condition (Kingery, 1974, Kingery and Friedman, 1974). As shown on the plates No. 1-5, there were no need for reheating samples because I had already known the firing condition below 573°C in terms of petrographic analysis and X-ray diffraction. There was no great differences among the surface topography themselves of the samples pictured by Scanning Electron Microscope, which means that there existed a common technique in making pottery at those times.

IV. Results

a. Firing condition

In terms of the petrographic analysis and X-ray diffraction, we can confirm the existence of alpha-quartz(SiO_2) in both the plain and red-painted polished pottery. They were fired below the 573°C which is the melting point of alpha-quartz into beta quartz when fired.

I presume that pottery, regardless of its paste and pigment on its surface, were fired under the low firing condition during the Plain pottery culture (Bronze Age) in general.

b. Clay

As the sample no. 4, clay used for making pottery is believed to be montmollionite, the same clay as used in the plain pottery discovered from the Yöngsan River Valley. However, sometimes another kind of clay is used as a paste for the making pottery as shown on the sample no. 5., because of the difficulty in obtaining montmollionite, and geographic distance.

c. Function

From the results analyzed, we can recognize the low firing condition of making both types of pottery during the Bronze Age in general, which means that the pottery itself is too weak and too porous to store liquid material.

This suggests that wooden vessels or leather bag was used instead of those types of pottery whose function was limited to store dried seeds or materials.

V. Conclusion

From these analyses, we can assume that there was a common technique in making pottery during the Bronze Age in general, although a little variance in the paste of pottery because of geographic distance and difficulty in obtaining resources. This result can be supported by the similar results of the plain pottery from the Yöngsan River Valley, although the latter one is included in the Later Bronze Age (300 B.C. -O). Comparison of plain pottery with the comb-pattern type pottery during the previous period in Korean prehistory will be needed for the general understanding for the Plain pottery culture (1983).

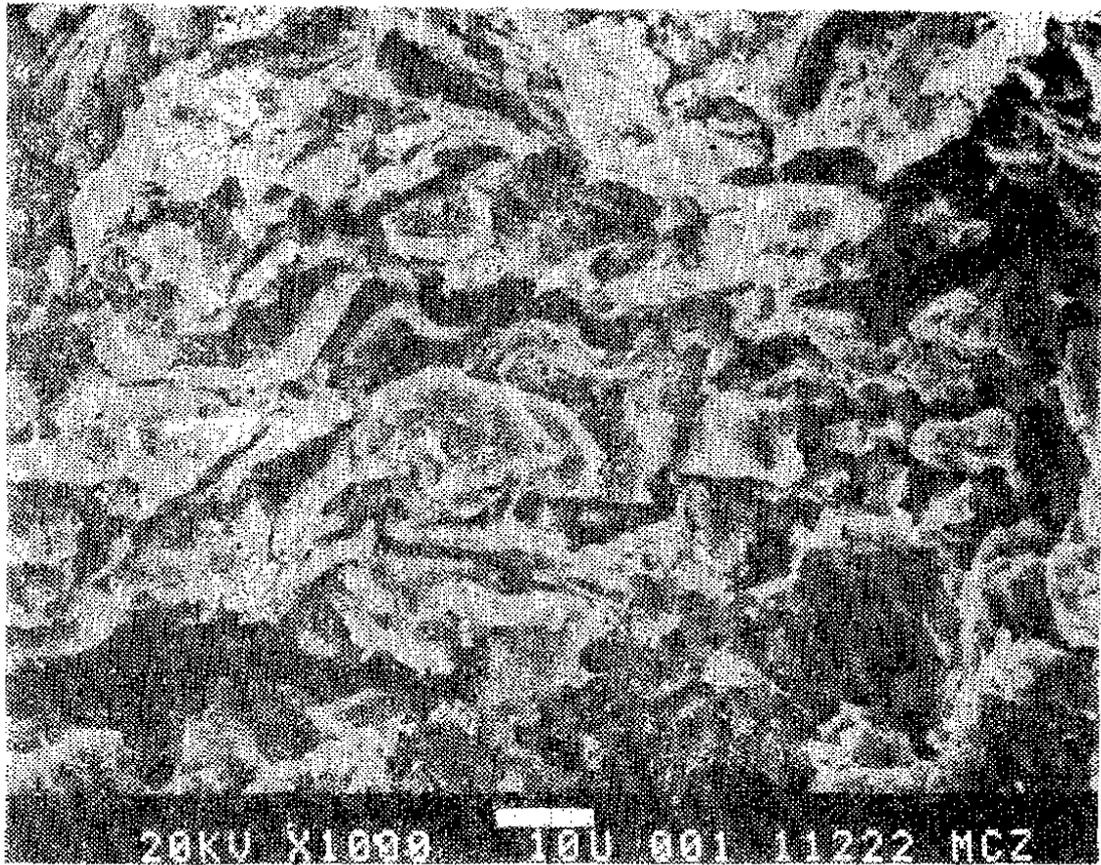


Plate. 1. Red-painted polished pottery ($\times 1,000$ and $\times 5,000$)

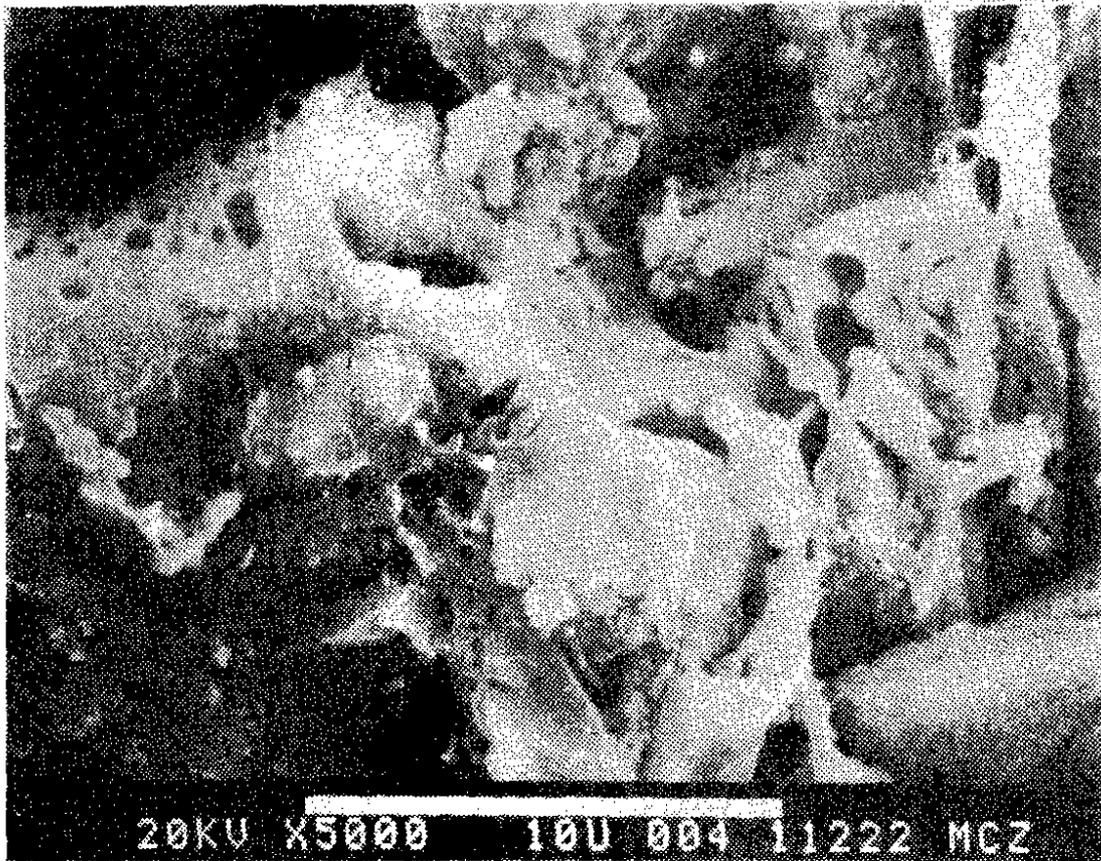
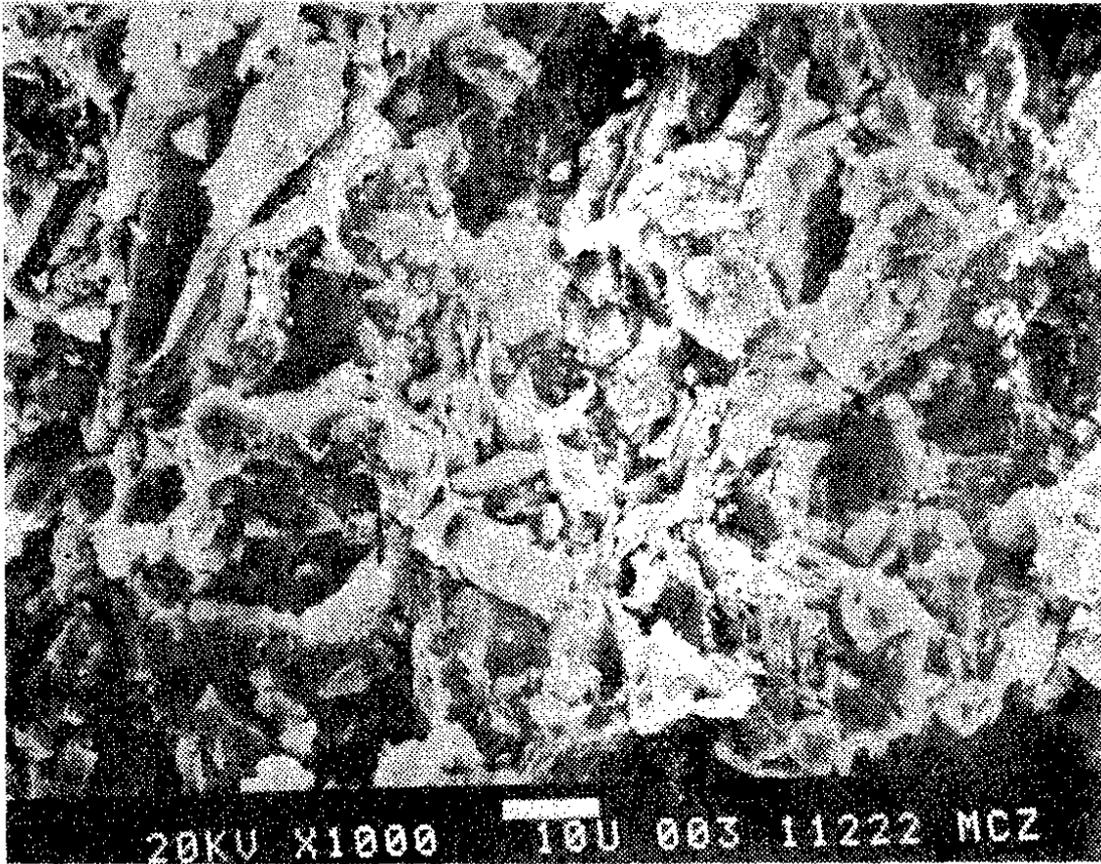


Plate. 2. Plain pottery ($\times 1,000$ and $\times 5,000$)

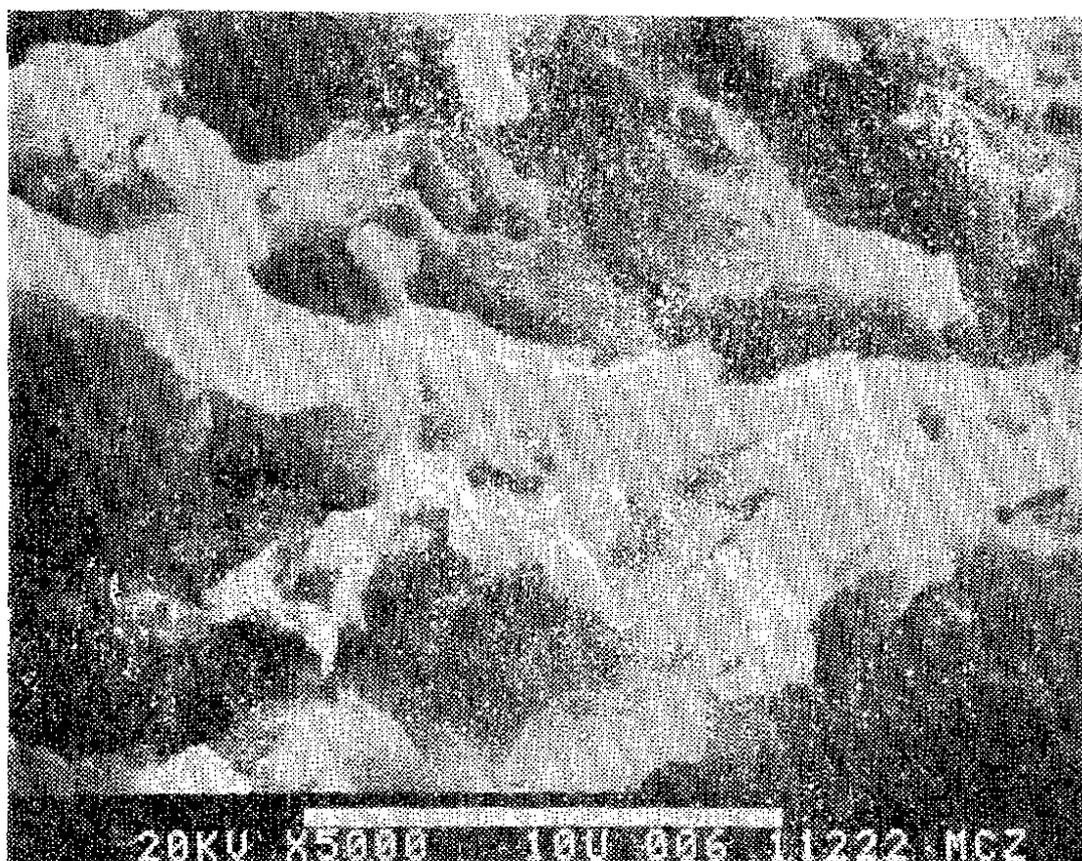
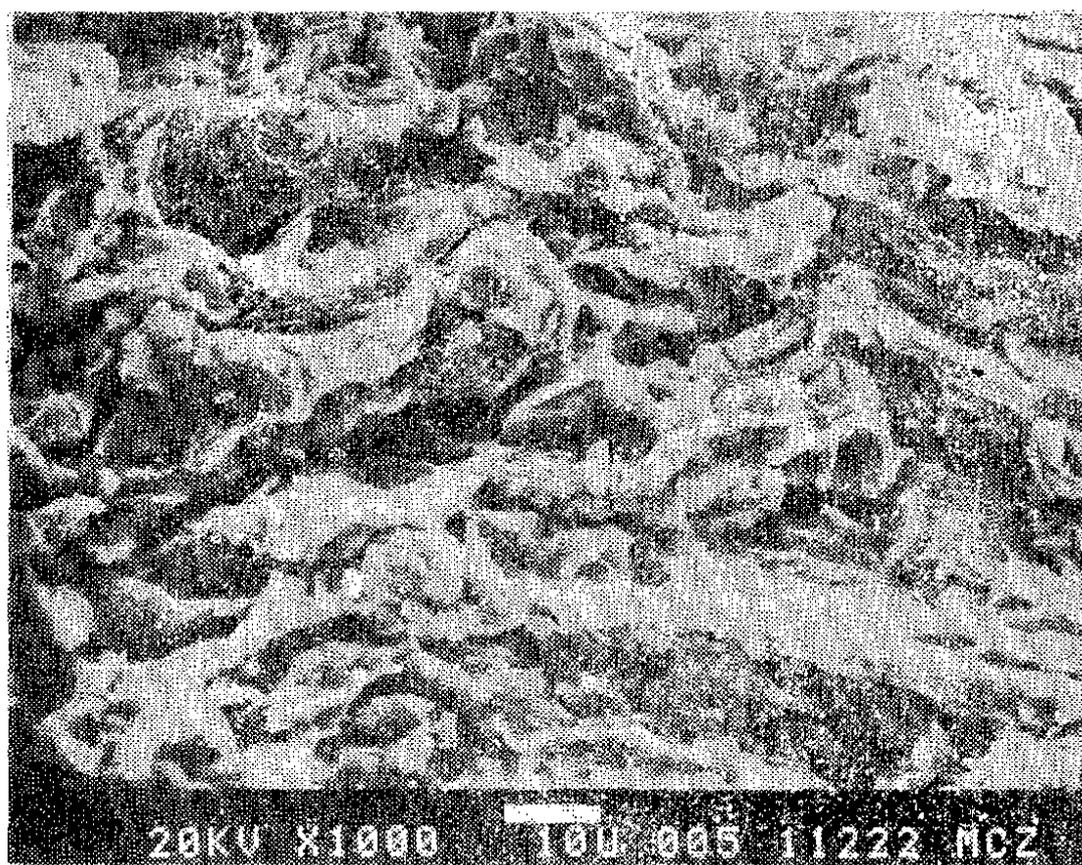


Plate. 3. Red-painted polished pottery ($\times 1,000$ and $\times 5,000$)

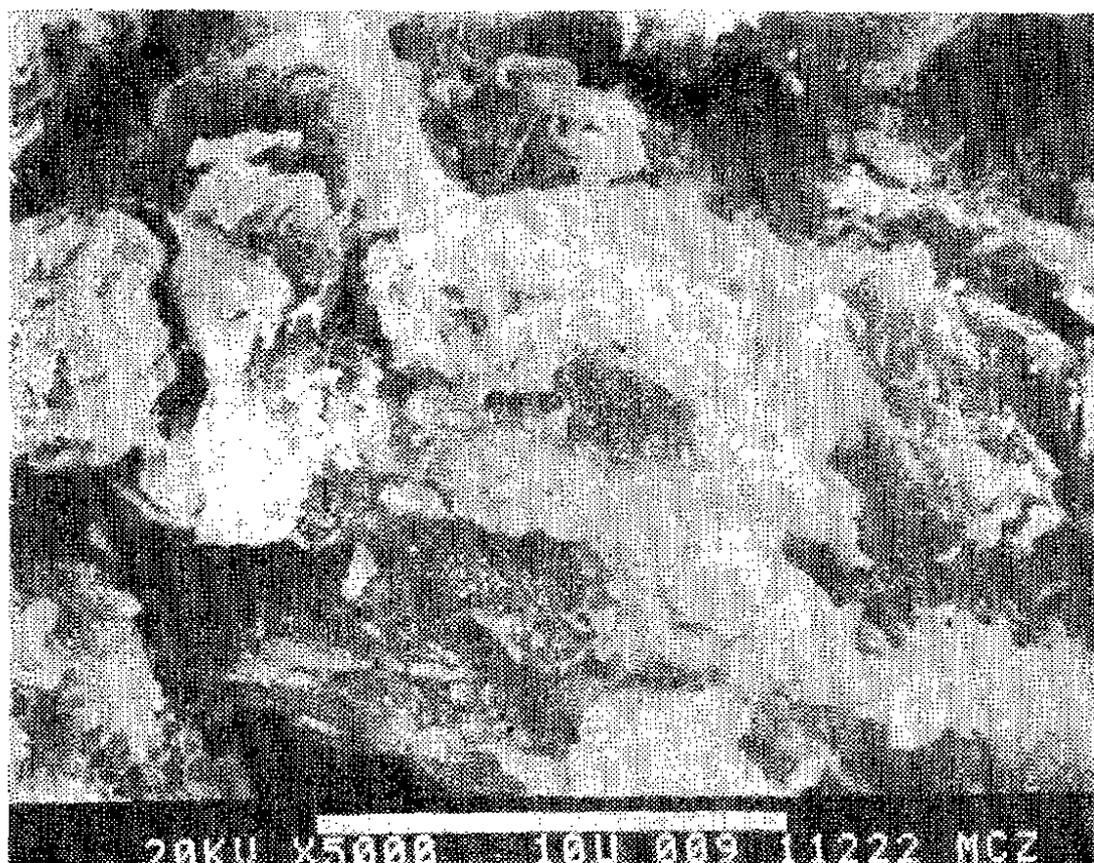
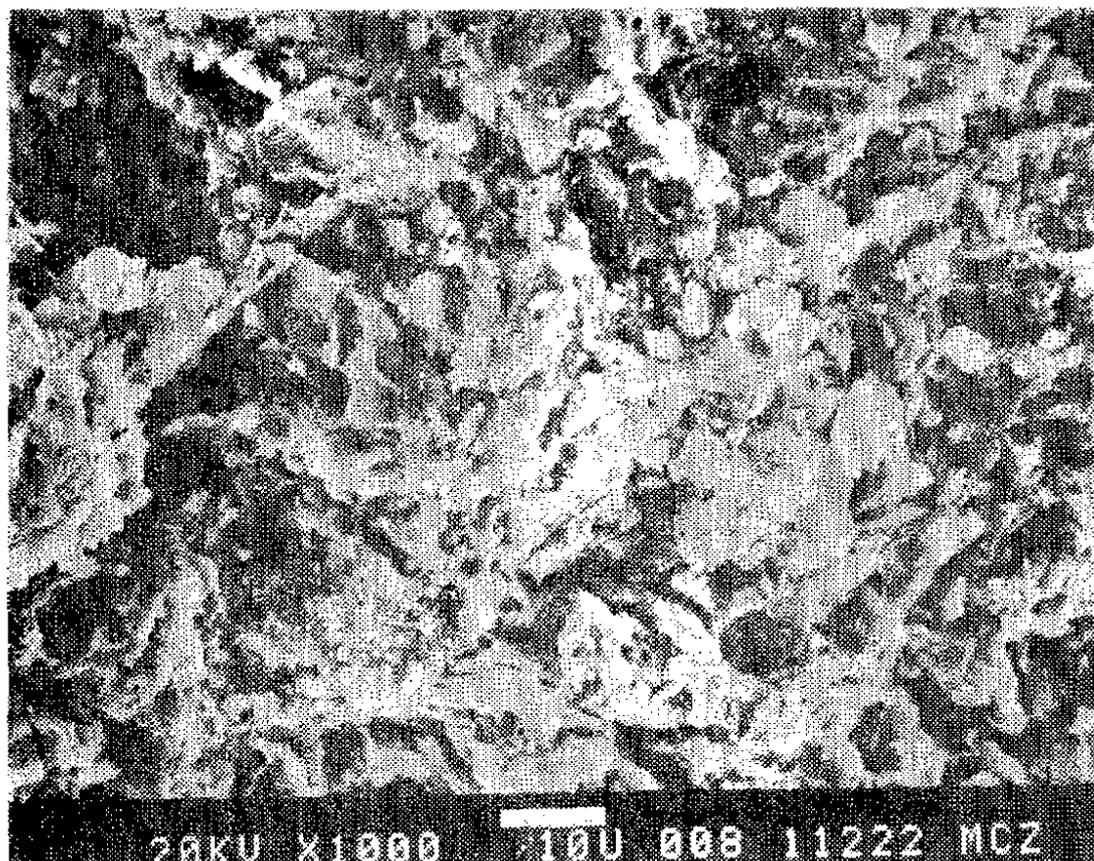


Plate. 4. Plain pottery ($\times 1,000$ and $\times 5,000$)

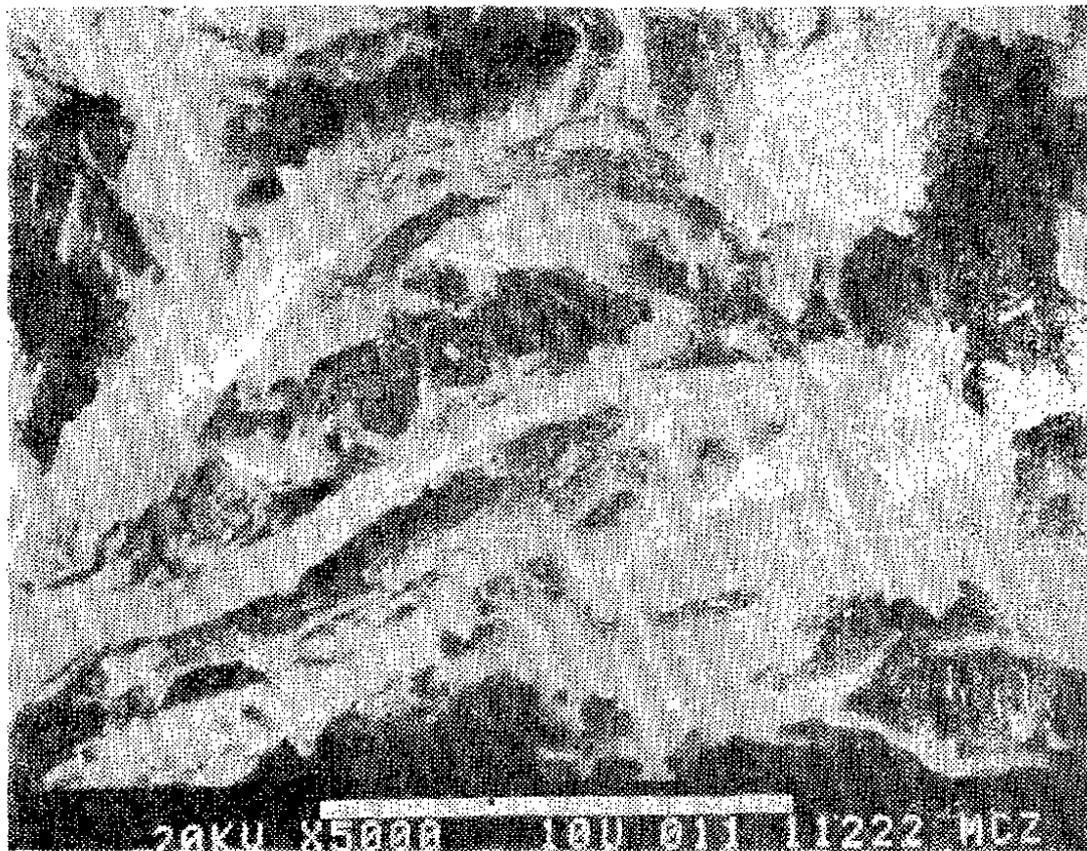
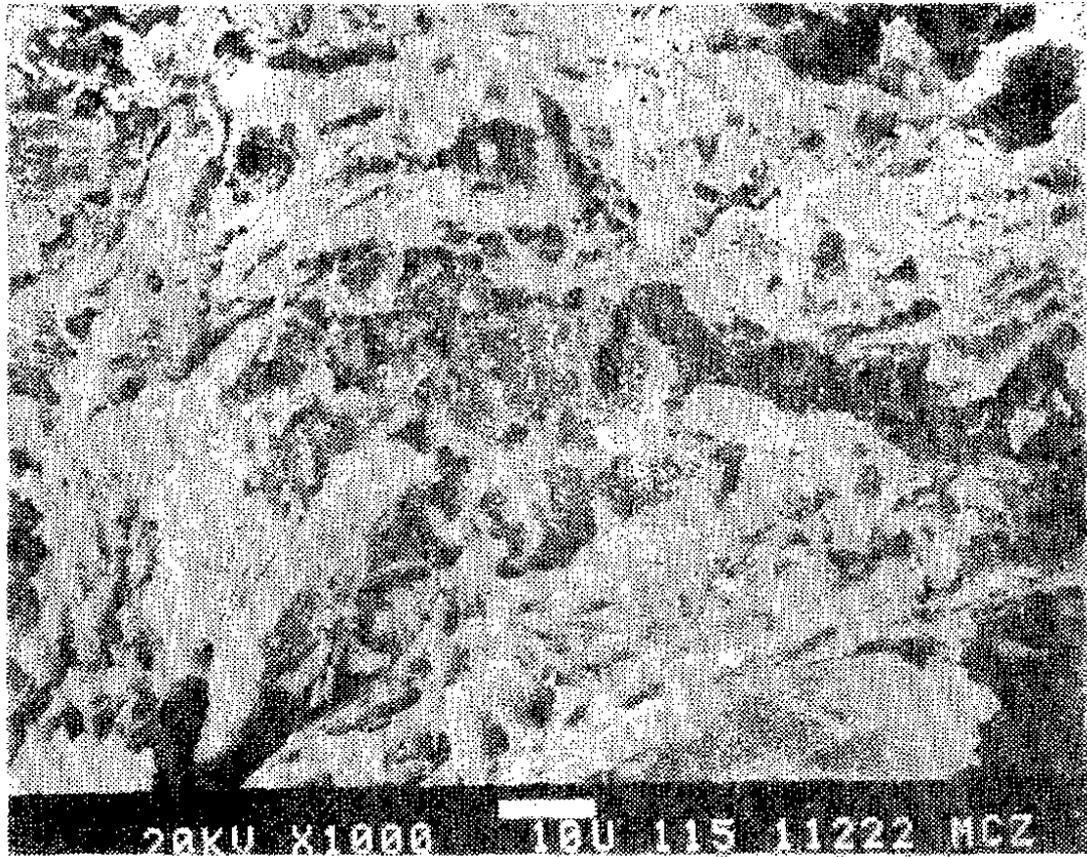


Plate. 5. Plain pottery ($\times 1,000$ and $\times 5,000$)

Acknowledgement

I wish to express my gratitude to Mr. Richard Newman and Eugene Farrel, conservation scientists in Fogg Arts Museum of Harvard University for the X-ray diffraction and Emission spectrographic analysis, to Mr. Jim Parker, Geology Department of Harvard University for the Spectrographic analysis, and to Mr. Ed Selling, Comparative Zoology of Harvard University for the Scanning Electron Microscope. Finally, I wish also to thank especially Mr. Richard S. Lanier (Director) and Ralph Samuelson (Program Associate) of Asian Cultural Council and Ministry of Education of Korea whose encouragement and financial support was able to finish this small paper during my stay at Cambridge and Seoul, and finally to express my special gratitude to my friend, Mr. Jeffrey Kao, Dept. of Anthropology of Harvard Univ. for reading this small paper and correcting errors (1983).

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〈국문요약〉

“충청북도 제원군 양평리 주거지에서
발굴된 무문토기와 홍도의 과학적 분석”

南漢江流域의 先史文化研究(2)

서울대학교 인문대학 고고미술사학과 조교수
최 몽 룡 (崔夢龍)

1981년 필자는 영산강유역에서 발굴된 무문토기편들의 과학적인 분석을 통해 당시의 문화를 복원하고자 시도한 바 있다. 금번 충청북도 제원군 양평리 주거지에서 발굴된 무문토기와 홍도편을 다시 하안도대학내 관계연구소에서 과학적인 분석을 해 본 결과,

- 1) 주거지의 연대는 적어도 서기전 7세기경 이전이며,
- 2) 무문토기와 홍도 모두 573°C 이하에서 구워졌으며,
- 3) 무문토기의 경우 석영과 장석이 균형이 있게 섞여진 반면 홍도의 경우 석영이 장석에 비해 압도적으로 많이 섞여졌으며,
- 4) 분석된 영산강유역의 무문토기와 남한강유역의 무문토기는 시기적으로 약간 다르게 구워졌다고하나 태토에 있어서 근본적으로 비슷한 것으로 나타났다. 따라서 이는 무문토기시대에 토기를 제작하는데 있어 전반적으로 공통의 기술을 가지고 있었음을 알 수 있게 되었다.
- 5) 이상의 결과로 일상용기로서 무문토기 대신 가죽이나 나무로 만들어진 용기의 사용이 강력히 시사됨을 알 수 있다(1983).