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Sāmānid Ceramics and Neutron Activation Analysis

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SĀMĀNID CERAMICS AND NEUTRON ACTIVATION ANALYSIS

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Glazed pottery known as "Afrāsiyāb" and "Nīshāpūr" wares represent one of the largest and most attractive series of early Islamic ceramics. Discovered in Transoxiana, Uzbek S.S.R., and Kharāsān, in northeastern Iran, these wares are generally attributed to the period of the fluorescence of the early Islamic east Iranian world, ruled by the Sāmānid dynasty 819-1005. The vitality and originality of decoration, distinctive glazing techniques (usually underglaze painting using pigments mixed with PbO and clay), and the decorative use of Arabic inscriptions in an otherwise Persian speaking milieu, were some of the factors that generated interest in these ceramics. However, the lack of firm archaeological contexts for much of this pottery and the general similarity of Sāmānid wares to those produced as far away as Mesopotamia and Egypt, have raised questions about the nature of the relationship between different types of Sāmānid wares and about the identification of their proveniences.

The object of the present paper is to present the results of laboratory investigations of the clay composition of Sāmānid wares and discarded kiln items found in situ, in an effort to answer some of the questions raised by previous studies. Neutron activation analysis has been used to determine elemental composition patterns of wares collected from Afrāsiyāb and Nīshāpūr. These have been compared with the clay compositions of kiln items from Nīshāpūr and with sherds collected at a number of other sites in Kharāsān and Transoxiana.

The three major categories of Sāmānid ceramics, identified as Color Splashed, Black on White and Buff wares, were all discovered in large numbers at Nīshāpūr.[1] But only two of the major types, the Color Splashed and Black on White wares, are represented at both Afrāsiyāb (Old Samarkand) and Nīshāpūr.[2] However, there are several wares unique to each site such as the Yellow and Green Opaque glazed wares of Nīshāpūr and the Green and Purple Overglaze on Opaque White from Afrāsiyāb.

Sāmānid Color Splashed ware, like other examples of this ware produced in various parts of the Near East from the end of the tenth century, has a clear lead glaze over splashes of underglaze yellow, green, and brown or purple pigments. The pigments were placed on a white slip (engobe), that was used to coat the reddish clay used by Islamic potters.[3] In the Near East, Color Splashed ware, unlike its Chinese models, the three-color glaze ware of the T'ang period, was soon embellished with graffiato designs incised over or under the slip before the application of the glaze.

Sāmānid Black on White ware, also ultimately modelled after the Chinese Tz'u chou ware, was the distinctive produce of Sāmānid workshops. Its prototype, Chinese porcelain, the white, vitrified, hard and resonant ware made of glazed white kaolin and fired at high temperatures, had been known in the Near East from at least the ninth century.[4] But in Near Eastern ceramic workshops kaolin was substituted by the fine white slip that covered the coarser

and darker clay body. The slip was then glazed in a number of ways so as to produce the effects of translucent Chinese porcelain. The potters of Mesopotamia experimented with a tin-oxide opacified lead glaze, which though fired at relatively low temperatures, produced an opaque and lustrous white surface. In Mesopotamia cobalt blue, copper green, and later other pigments were added to embellish the opaque white ware.[5]

Sāmānid ceramic workshops in Tranxoxiana and Kharāsān were not successful in their imitation of Mesopotamian Luster ware.[6] Nīshāpūr and Samarkand were both situated on the land route that brought Chinese goods to Mesopotamia. But because of the cultural preeminence of the metropolitan centers of Mesopotamia, the seat of the Arab caliphate, glazing techniques of the east Islamic potters were dependent on Mesopotamian rather than Chinese models.[7] Sāmānid Black on White ware, known also as "Afrāsiyāb" or Samarkand" ware, after the place of its first discovery, represents a regional version of the opaque wares of Mesopotamia. The white slip under the transparent lead glaze in this ware was decorated with purplish-black or brown slip painted patterns or with epigraphic notations that expressed aphorisms or good wishes.[8] The earliest examples of this ware, made in the ninth and tenth centuries, are characterized by stark and sparsely distributed kufic inscriptions usually placed around the rim or across the bottom of the dish.[9] First discovered in large numbers at Samarkand, this ware is now known from Lashkari Bāzār in Afghanistan, Merv in Soviet Turkmenistan, Tashkent in Soviet

Uzbekistan, and Gurgān and Nīshāpūr in Iranian Kharāsān.[10] Wasters found at Samarkand and Nīshāpūr indicate at least two different production centers. But despite their apparent mutual similarity, the wares from the two sites differ in typology, style and clay color. As a general rule the Nīshāpūr wares were made of a light firing clay whereas the Samarkand wares were made of a red or reddish yellow clay.[11] However, we have found that this is not absolute, reddish yellow to pink bodies exist on Nīshāpūr wares and some of our analysed Afrāsiyāb sherds are light brown. This attractive ware was evidently known and admired in other parts of the Islamic world, since less successful imitations of it were produced simultaneously with tin glazed ware at Susa and elsewhere.[12]

With the introduction of red iron pigment, the austere and sober decoration of the Black on White ware gradually gave way to a more varied repertory of motifs consisting of knotted ribbons, foliate kufic letters and floral motifs of the Polychrome on White Ware. This decorative scheme was further expanded by the addition of colors that included olive green, green, yellow and raw sienna.[n. b. Wilkinson, p. 128 ff.] In some wares the color scheme was reversed and white was used to decorate a colored slip, Slip-painted Ware with Colored Engobe.[13] (p. 158ff.)

Buff ware, the last major category of ceramics produces under the Sāmānids, is known after its buff colored body which was lead glazed with or without the bone-colored slip.[14] By contrast to the disci-

plined grace of the decoration of the Black on White ware, the decoration of the Buff ware is characterized by a lavish use of underglaze color, principally a bright mustard yellow supplemented by black, green and occasionally red, used in designated areas that emphasize the gay and exuberant ornamentation. Geometric, floral and figural motifs are here arranged freely around a central theme. Human figures depicted in casual pursuits are frequently shown against a random selection of animate and inanimate background motifs. One of the most striking examples of this ware, a large shallow bowl from Nīshāpūr, in the Teheran Museum, shows an equestrian male figure accompanied by a cheetah, and surrounded by animal and plant motifs. The gay and cavalier treatment of the composition, and the playful treatment of details such as the foliate patterns on the horse's body, suggest a casual approach that stands in sharp contrast to the sober restraint expressed by the simple motifs and epigraphic decoration of the Black on White ware. Both differ in decorative emphasis from the Color Splashed ware. But all three categories were discovered in large quantities at Nīshāpūr.

Neutron activation analyses (NAA) were made on a group of thirty-two sherds found at Nīshāpūr. These sherds had been kindly loaned by Dr. Richard W. Bulliet. Included in this group were the three main categories of Sāmānid ceramics already discussed as well as a hand-made stilt (tripod) which was kiln furniture. Front and back photographs of the sherds are shown in Figs. 1-6. As a control group of pottery from the Samarkand area, eight vessels from

Afrāsiyāb were sampled. These vessels had been generously loaned by the Victoria and Albert Museum, London, to the exhibition on Medieval Ceramics VI to XIII Centuries at the Frederick S. Wight Art Gallery at the University of California at Los Angeles (1975). Our samples SMKD 1-8 were taken from the vessels numbered 20-27 respectively in the catalogue of that exhibit.

In the NAA measurements the abundances of about forty elements are determined. Over twenty of these are measured with sufficient accuracy and are sufficiently independent to be used for provenience determinations of pottery. As the methodology of the measurements is described in other papers presented at this conference it is not necessary to repeat it here. From the NAA studies it is easy to distinguish between the two areas. Aluminum and iron are very abundant and are expressed in percent. The other elements are present in only trace amounts and are expressed in parts-per-million. Nonetheless the latter are very important in provenience determinations. The first bar in each of the six graphs of Fig. 7 show the average abundance of the given element for 19 sherds from Nīshāpūr which have a similar chemical abundance pattern. The hatched area at the top of the bar shows the variation for that element, expressed as a root-mean-square deviation, among the nineteen sherds. The second bar in each graph shows the same quantities for the eight Afrāsiyāb vessels. It is seen that there is almost no overlap in any of the 6 graphs between the Nīshāpūr and Afrāsiyāb groups. The

third bar in each graph shows the same quantities again for a group of 6 sherds from Nīshāpūr with a similar chemical profile. As can be seen from Fig. 7, the latter group closely matches the Afrāsiyāb group and is distinctly different from the Nīshāpūr group.

The groups of 19 sherds from Nīshāpūr, which we call Nīshāpūr A or Nish A, includes sherds of Buff ware, a handmade stilt tripod (kiln furniture) Black on White ware and Color Splashed ware. This group should represent a chemical profile local to Nīshāpūr as it contains kiln furniture and the Buff ware which is known to originate in Nīshāpur. The group of eight vessels sampled from Afrāsiyāb include Black on White ware and Color Splashed ware and some polychrome wares. All of these vessels, which represent several different types, have close to the same chemical profile, which may well be local to the Samarkand area. It would be desirable, however, to analyze kiln furniture, wasters, or local clays from Samarkand in order to establish the provenience with certainty. The chemical profiles of the Nīshāpūr and Afrāsiyāb groups are given in Table I.

The six sherds indicated by the 3rd set of bars in Fig. 7 contain Color Splashed ware and polychrome wares. As their chemical profile agrees so well with that assumed to be local to Samarkand, it seems likely that this pottery was imported to Nīshāpūr, possibly from the Samarkand area.

Of the remaining seven sherds, Nish-16 is very different from any of the others and it should also be an import. The other six sherds have compositions which are as different from the Nīshāpūr or Samarkand groups but not as much as Nish-16, and they cannot be assigned at this time.

In his final report of the excavations of the Metropolitan Museum of Art at Nīshāpūr, C.K. Wilkinson asserted that the Color Splashed, Black on White and Buff wares represented the three major categories of wares produced in the pottery workshops of Nīshāpūr. On the basis of typological, technical and stylistic analyses of these wares, Wilkinson postulated that whereas the Color Splashed and Black on White wares of Nīshāpūr represented local variants of ceramic types produced in other Islamic workshops, the figural style of the Buff ware of Nīshāpūr originated in the local workshops of Nīshāpūr which preserved elements from the pre-Islamic artistic tradition of the east Iranian world.[15] The results of the neutron activation measurements are consistent with Wilkinson's analyses and offer a method of distinguishing between pottery made at Nīshāpūr and at Samarkand.

TABLE 1

Chemical Groups and Abundances of Nīshāpūr and Samarkand Pottery[a]

Group Number of sherds	Nish A 19	Samarkand 6
Major elements expressed in %:		
Al	7.59 ± .26[b]	6.37 ± .38
Ca	7.7 ± .9	7.0 ± 1.1
Fe	4.24 ± .23	3.32 ± .24
K	2.49 ± .35	2.12 ± .19
Na	1.28 ± .19	1.00 ± .05
Ti	.395 ± .035	.376 ± .027
Trace elements expressed in ppm:		
Ce	59.5 ± 3.0	68.0 ± 2.3
Co	18.32 ± 1.25	10.66 ± .83
Cr	129 ± 17	158 ± 12
Cs	6.47 ± .80	7.10 ± .46
Dy	4.23 ± .20	5.08 ± .37
Eu	1.147 ± .043	1.248 ± .064
Hf	4.74 ± .39	6.22 ± .45
La	28.9 ± 1.5	34.2 ± 1.2
Lu	.314 ± .031	.379 ± .031
Mn	913 ± 83	571 ± 11
Ni	81 ± 24	44 ± 13
Sc	15.02 ± .87	12.83 ± .84
Sm	4.745 ± .189	5.757 ± .289
Ta	.951 ± .055	.911 ± .023
Th	10.33 ± .75	11.34 ± .22
U	2.26 ± .28	4.70 ± .88
Yb	2.31 ± .18	2.73 ± .16
Average σ:[c]	9.1%	7.3%

[a] Abundances were calibrated vs. Standard Pottery.

[b] Entries after the ± signs are the larger of the root-mean-square deviations or the standard deviation errors due to counting radioactivity.

[c] These are the average of the root-mean-square deviations for 23 elements expressed in percent.

NOTES

1. C. K. Wilkinson, Nīshāpūr, Pottery of the Early Islamic Period, New York, 1975.

2. K. Erdmann, "Afrasiab ceramic wares," Bulletin of the Iranian Institute VI-VII, New York 1946, 102-110.

3. Ibid., #3, #4; A. Lane, Early Islamic Pottery, Mesopotamia, Egypt and Persia, London 1953, 12; Wilkinson, Nishapur, #2, 54ff; J. D. Frierman, Medieval Ceramics, VI to XIII Centuries, Frederick S. Wight Art Gallery, University of California, Los Angeles 1975, 13-14; E. Atil, Freer Gallery of Art, Fiftieth Anniversary Exhibition. III. Ceramics from the World of Islam, Washington 1973, 3; M. Rosen-Ayalon, La poterie islamique,[Mémoires de la délegation archéologique en Iran L, Mission de Susiane, Ville Royale de Suse IV,]Paris 1974, #5, #19, #20; Y. Crowe, "Certains types et techniques de la céramique de Suse," Atti, VII convegno internazionale della ceramica, Albisola, 31-Maggio - 3 Giugno 1974, Centro ligure per la storia della ceramica Albisola, Villa Faraggiana, Albisola 1974, 78.

4. Lane, Early Islamic Pottery, 10-11; W. Willetts, Chinese Art II, Penguin Books 1958, 393ff.

5. F. Sarre, Die Keramik von Samarra, Die Ausgrabungen von Samarra II, Berlin 1925, 43ff. Lane, Early Islamic Pottery, 13-14; Wilkinson, Nishapur, #6, 179ff; Frierman, Medieval Ceramics, 13; E. Atil, Art of the Arab World, Freer Gallery of Art, Washington, D.C. 1975, #9; Rosen-Ayalon, La poterie islamique, #17.

6. Wilkinson, Nishapur, 179ff.

7. Ibid., xlii.

NOTES 2

8. Erdmann, Afrasiab ceramic wares," #7, #8; R. L. Hobson, A Guide to the Islamic Pottery of the Near East, The British Museum, London 1932, 21-24; Lane, Early Islamic Pottery, 17-19; Victoria and Albert Museum, Islamic POttery 800-1400, London 1969; J. W. Allan, Medieval Middle Eastern Pottery, University of Oxford, Ashmolean Museum, Oxford 1971, 14ff; Atil, Freer Gallery of Art, Ceramics from the World of Islam, 4: Wilkinson, Nishapur, #3, 90ff.

9. S. Flury, "Calligraphy on pottery," A Survey of Persian Art, From Prehistoric Times to the Present, Ed. A. U. Pope, I-IV, London 1938-9, 1751ff; L. Volov, "Plaited kufic in Samanid epigraphic pottery, Ars Orientalis VI, 1966, 107-133; O. G. Bol'shakov, "Arabskie nadpisi na polivnoi keramike Srednei Azii IX-XII vv.," Epigrafika Vostoka XII, 1958, 23-39; XV, 1963, 71-87; XVII, 1966, 54-62; XIX, 1969, 42-50.

10. Wilkinson, Nishapur, 90.

11. Ibid.; Erdmann, Afrasiab ceramic wares," #5, #6, #7, #8; G. A. Pugachenkova, L. I. Rempel', Istoriva Iskusstv Uzbekistana, Moskva 1965, 165ff; Frierman, Medieval Ceramics, 14. Large collections of Black on White ware and its variants, found at Samarkand in the late nineteenth and early twentieth centuries, are housed in the Hermitage Museum, Leningrad, in the Kiev Museum, in the Museum for Eastern Culture, Moscow, and in the Samarkand Museum, see Bol'shakov, in Epigrafika Vostoka XII, 1958, 23 ff. A collection of early Islamic wares and sherds from Samarkand is housed in the State Museum, Berlin, see Erdmann, "Afrasiab ceramic

NOTES 3

wares." Other examples of early Islamic ceramics from Samarkand are housed in the Louvre and the Museum of Decorative Arts in Paris, for references to relevant publications, see J. Sauvaget, "Introduction de la ceramique musulmane," Revue des Etudes Islamiques XXXIII, Paris 1965, 8ff. The British Museum and Victoria and Albert Museum in London also house collections of early Islamic wares from Samarkand, see Hobson, A Guide to the Islamic Pottery of the Near East, 21-23; Victoria and Albert Museum, Islamic Pottery 800-1400, London 1969.

12. Rosen-Ayalon, La poteria islamique, 234ff.

13. Erdman, "Afrasiab ceramic wares," #5, #6, #7, #8; A. U. Pope, Ceramic art in Islamic times," A Survey of Persian Art, 1473ff; O. Grabar, "Notes on the decorative composition of a bowl from northeastern Iran," Islamic Art in the Metropolitan Museum of Art, ed. R. Ettinghausen, New York 1972, 91-98; Wilkinson, Nishapur, #1, 3-7.

14. Wilkinson, Nishapur, #1, 3-7.

15. Ibid.

FIGURE CAPTIONS

Fig. 1. Pottery from Nīshāpūr

Sherds Nish-1 → Nish-5

Fig. 2. Pottery from Nīshāpūr

Sherds Nish-6 → Nish-13

Fig. 3. Pottery from Nīshāpūr

Sherds Nish-14 → Nish-19

Fig. 4. Pottery from Nīshāpūr

Sherds Nish-20 → Nish-25

Fig. 5. Pottery from Nīshāpūr

Sherds Nish-26 → Nish-25

Fig. 6. Pottery from Nīshāpūr

Sherds Nish-30 → Nish-32

Fig. 7. Comparisons between Nīshāpūr and Afrāsiyāb pottery

Samples in groups:

Nīshāpūr A	Nish-2 → 7, 10, 12, 15, 22, 24	32
Afrāsiyāb	Smkd-1 → 8	
Imports	Nish-11, 17, 19 → 21, 23	

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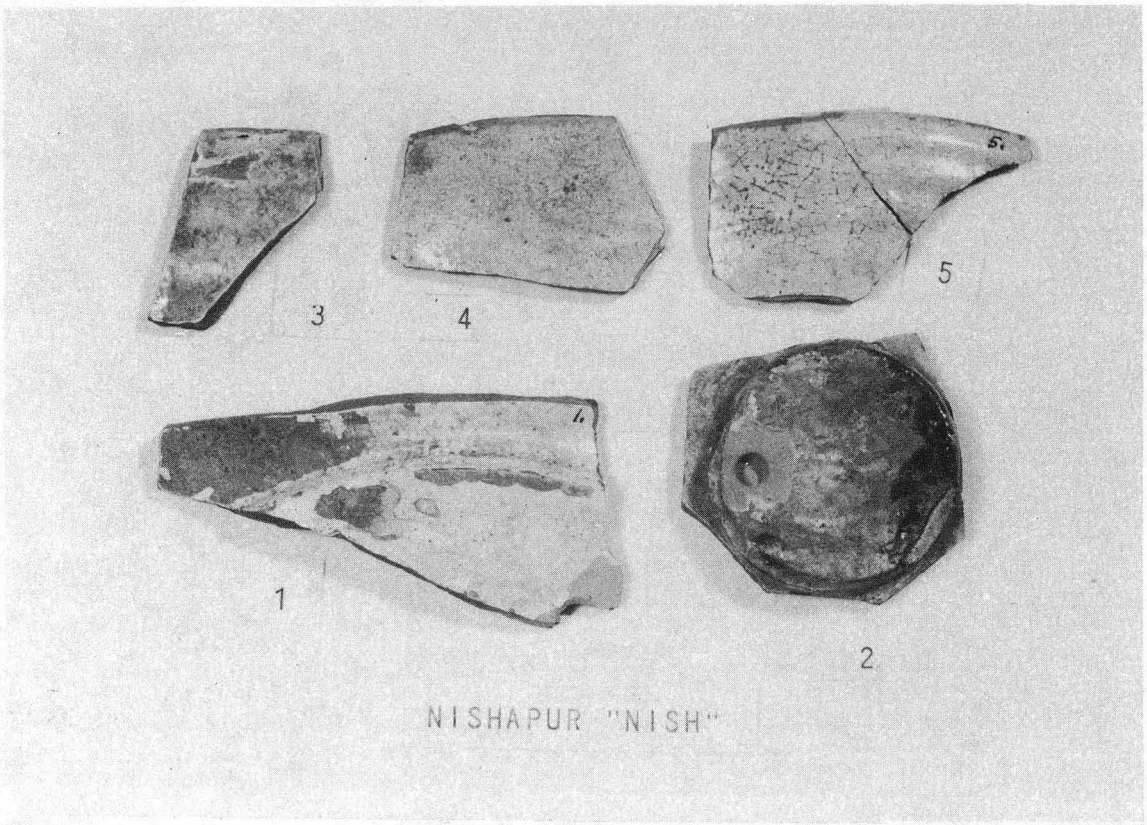

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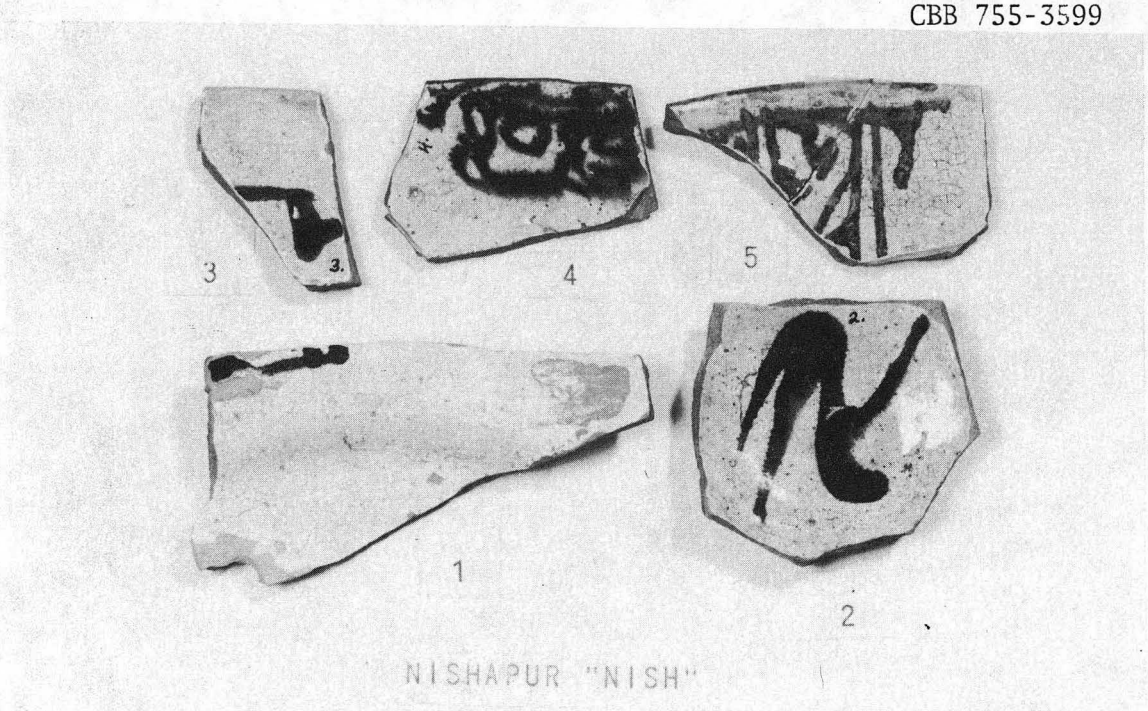

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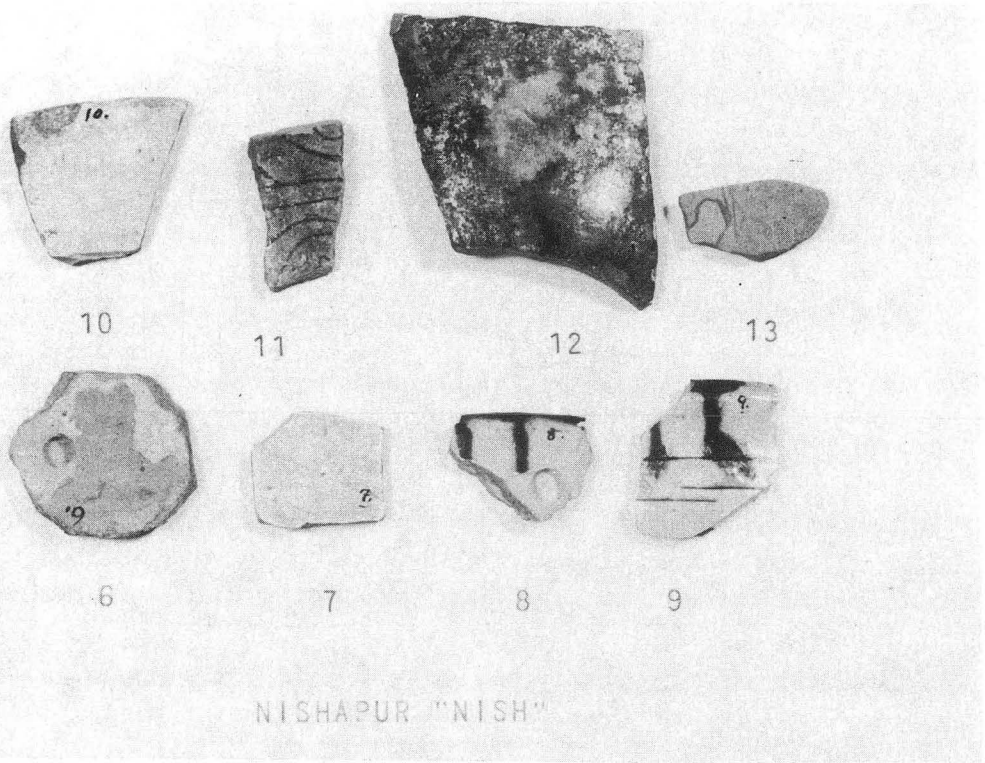
Fig. 1



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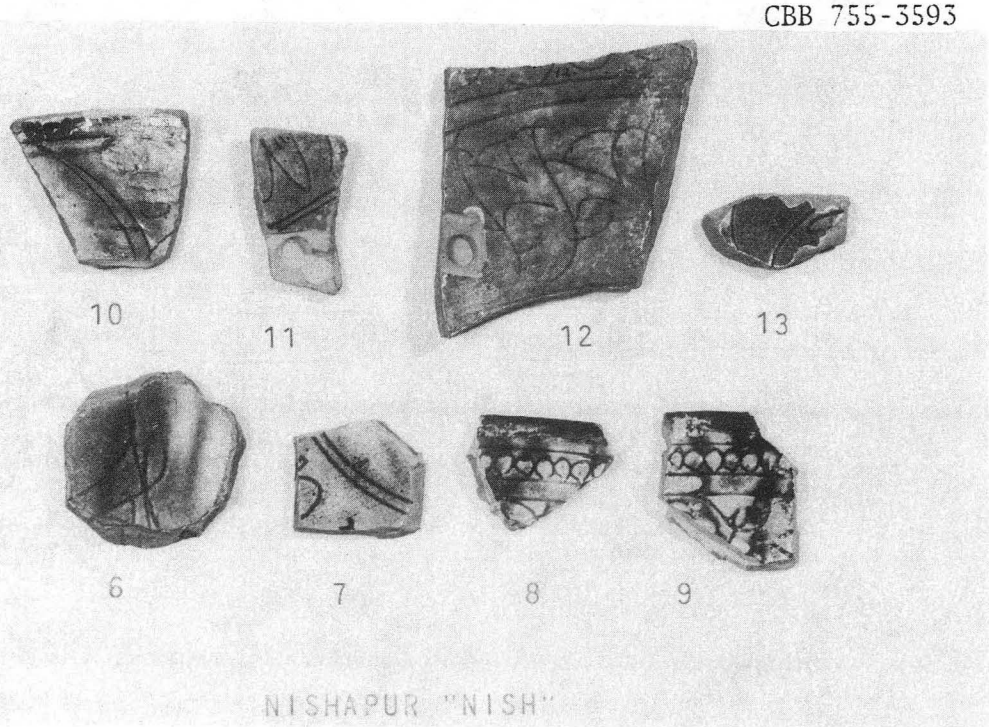

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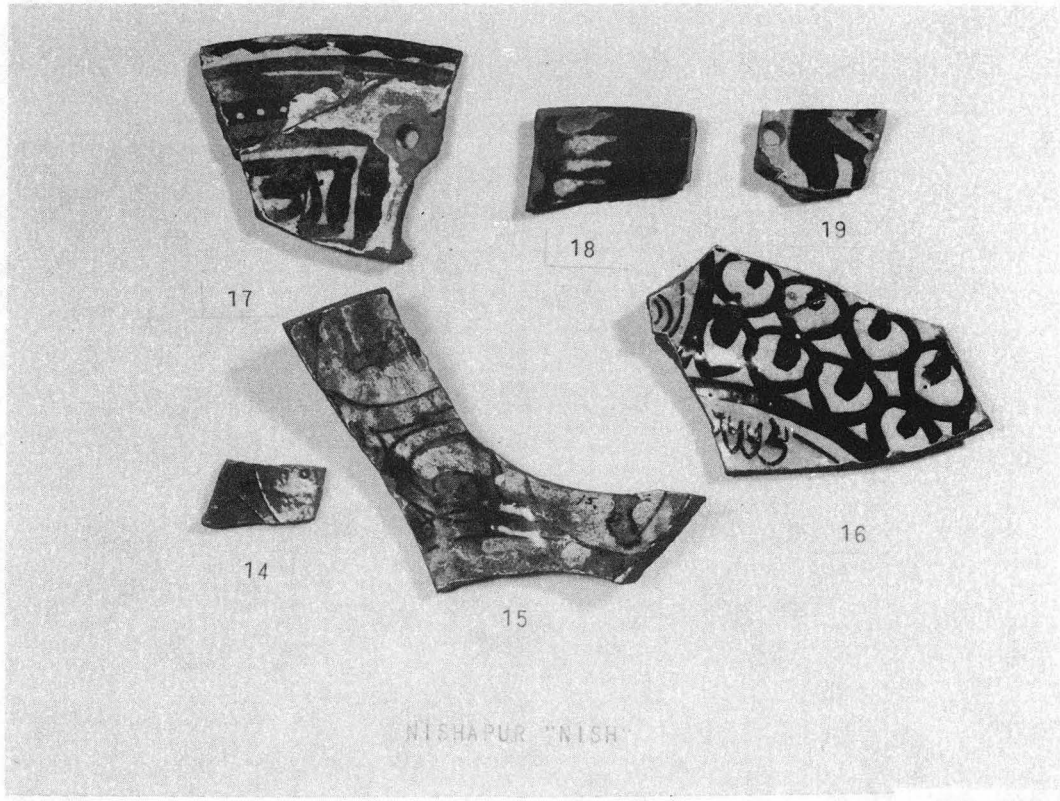
Fig. 2



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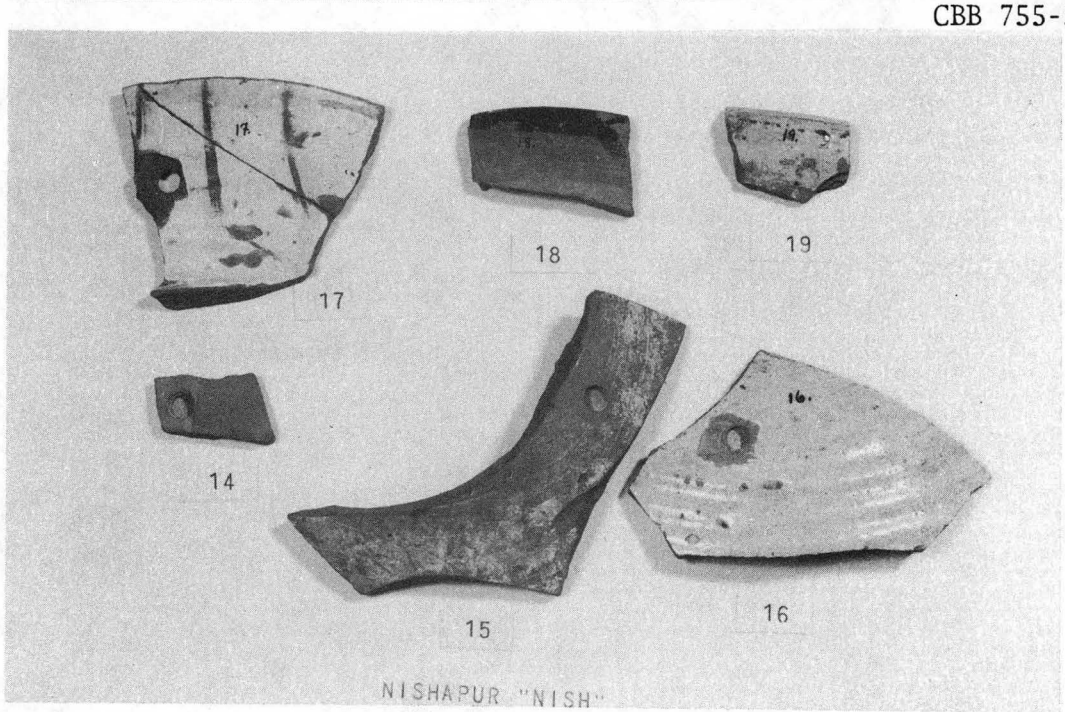

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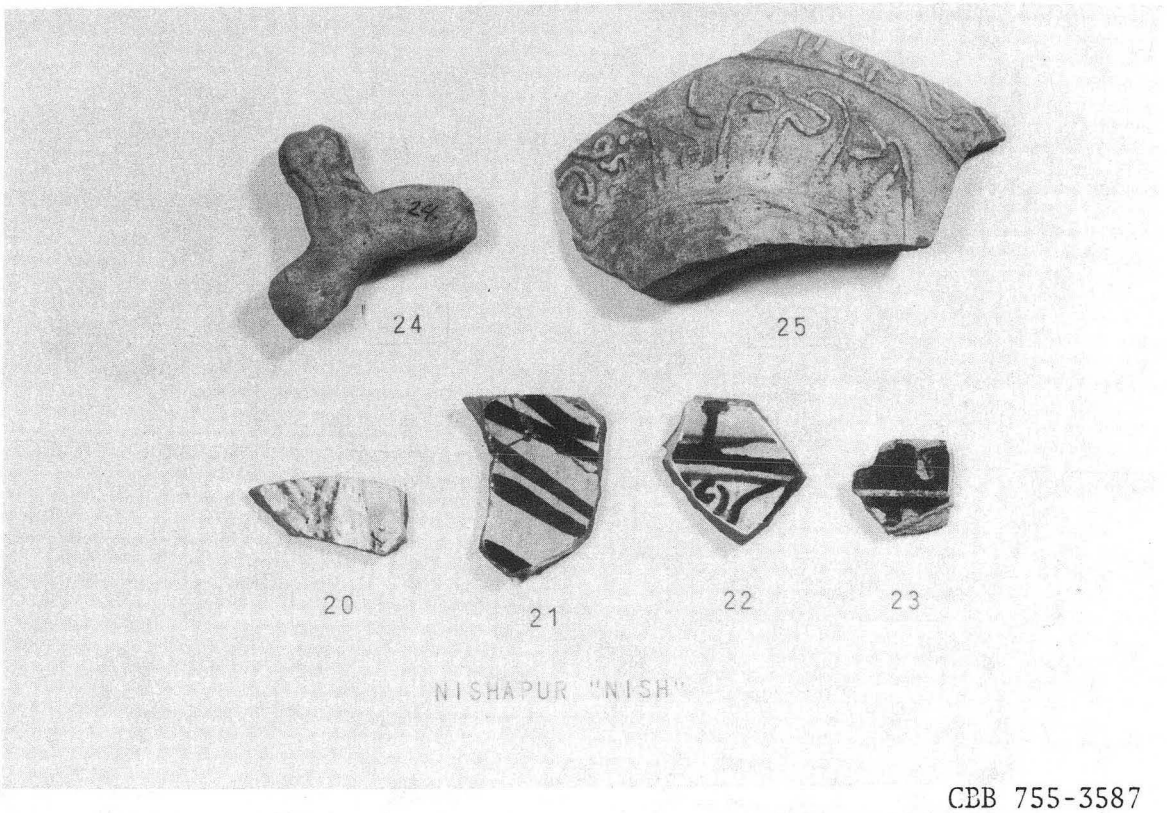
Fig. 3



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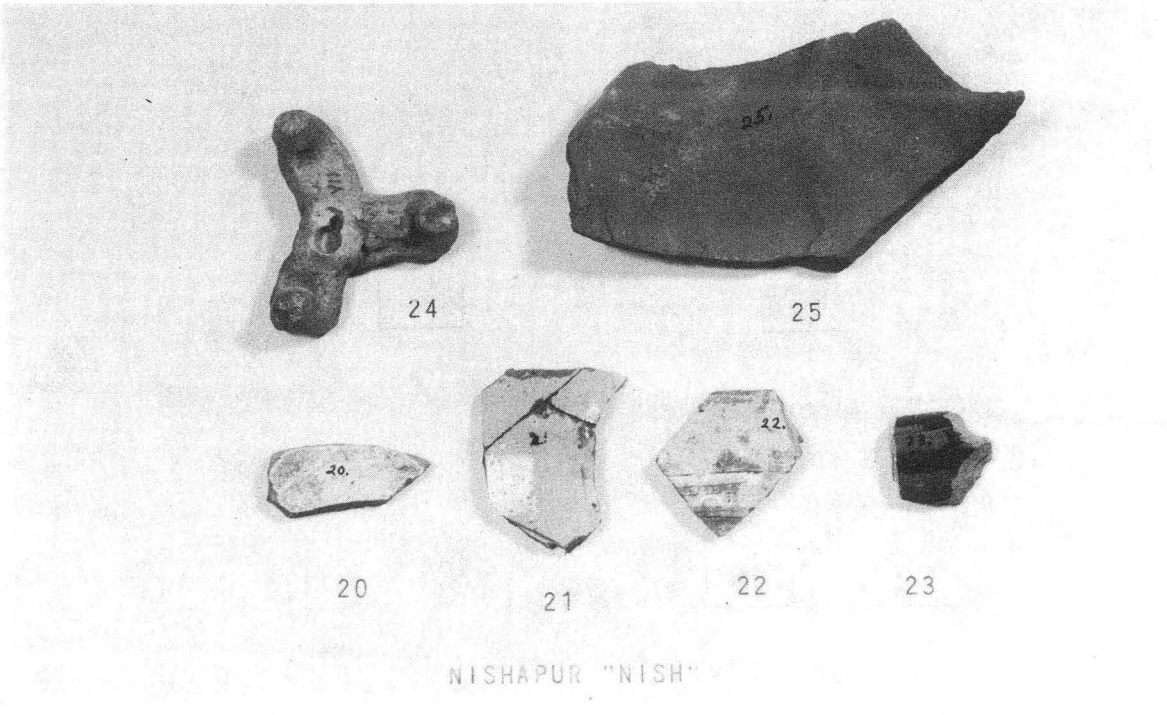

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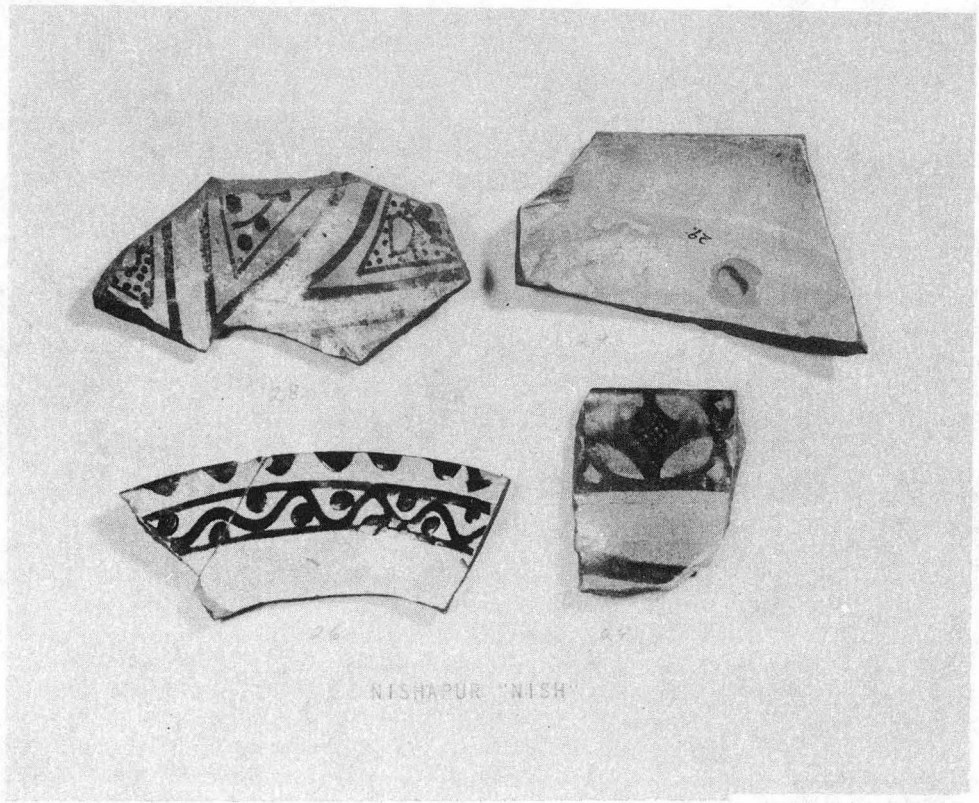
Fig. 4



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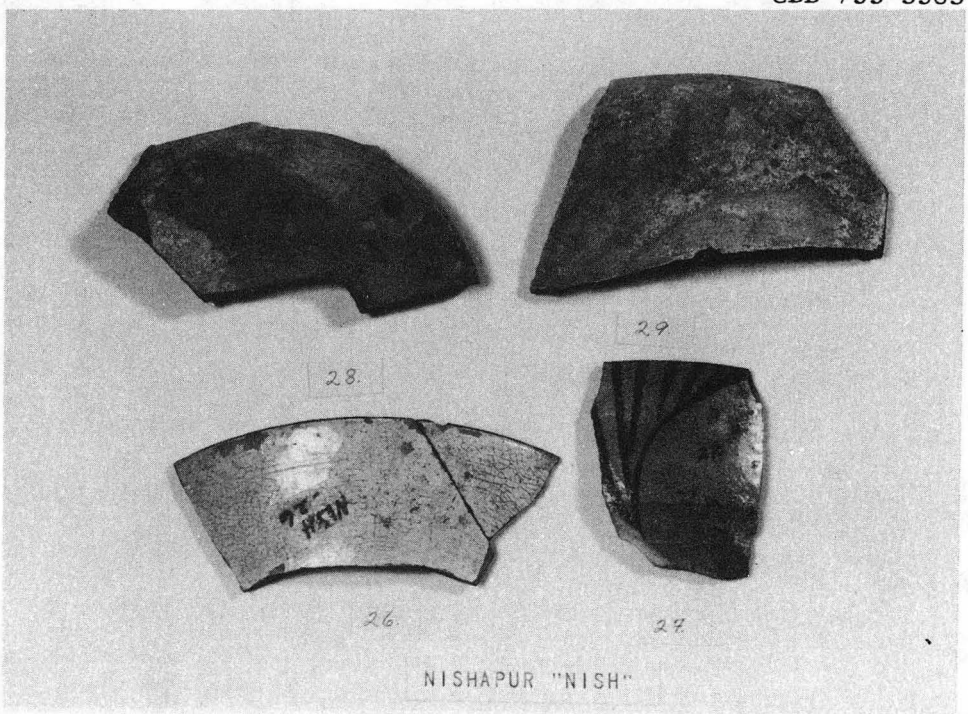

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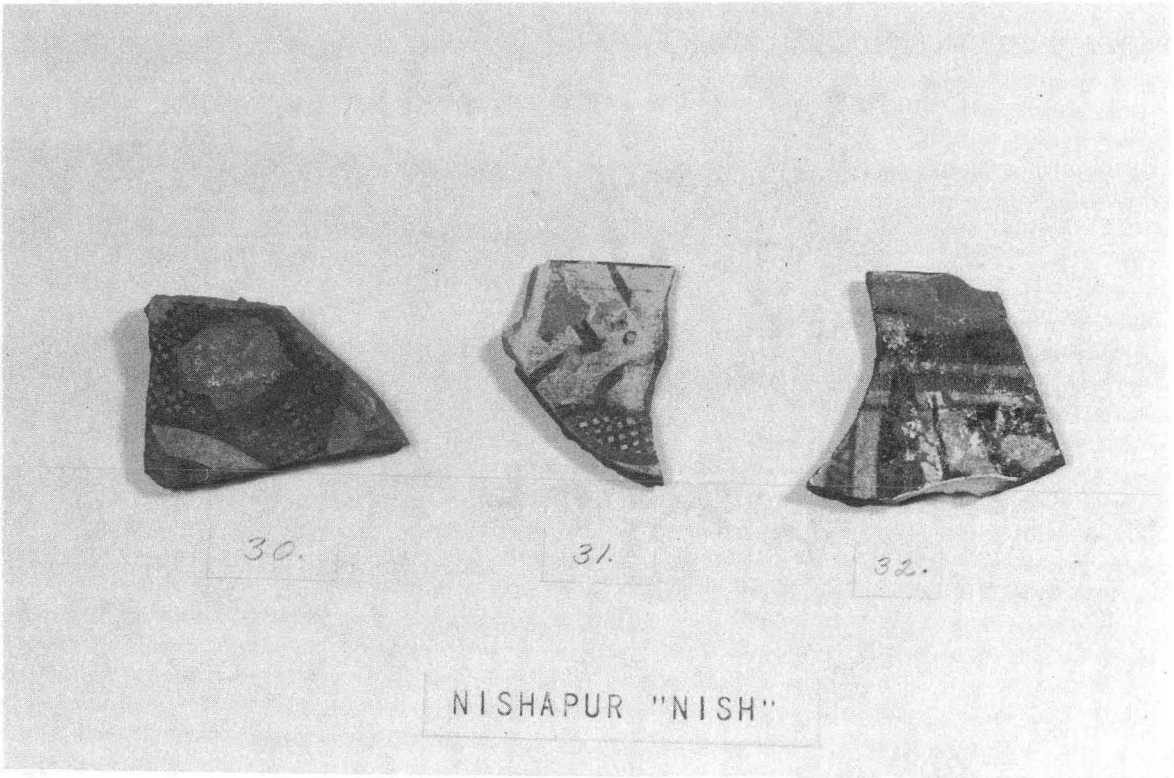
Fig. 5



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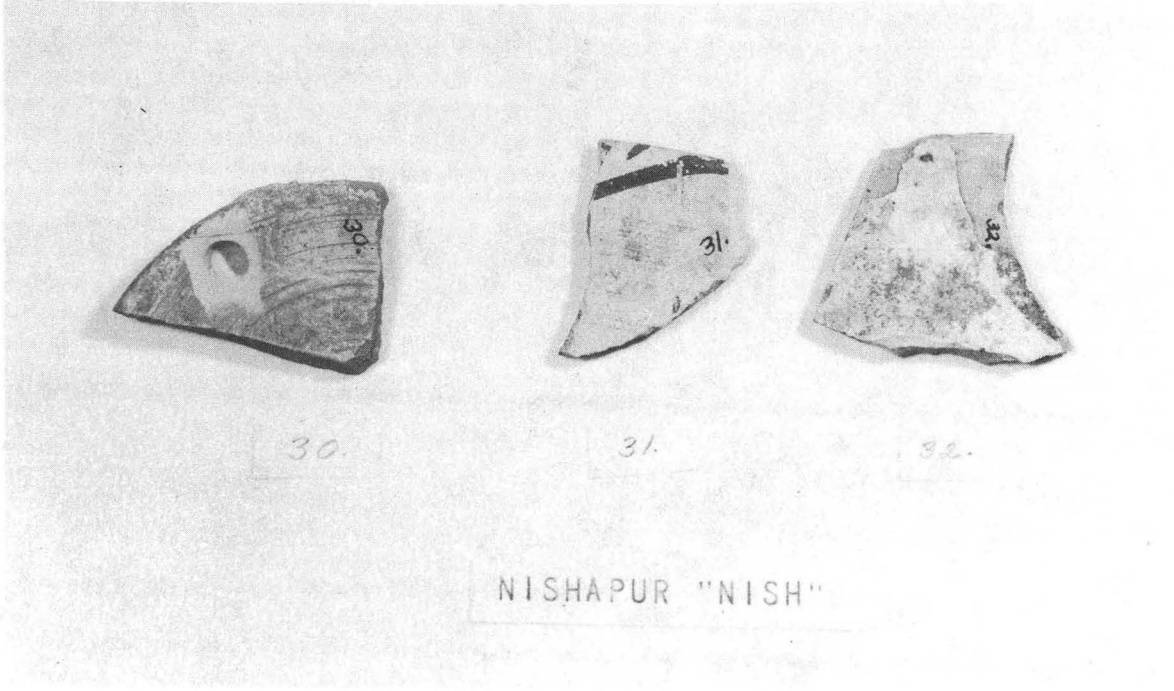

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Fig. 6

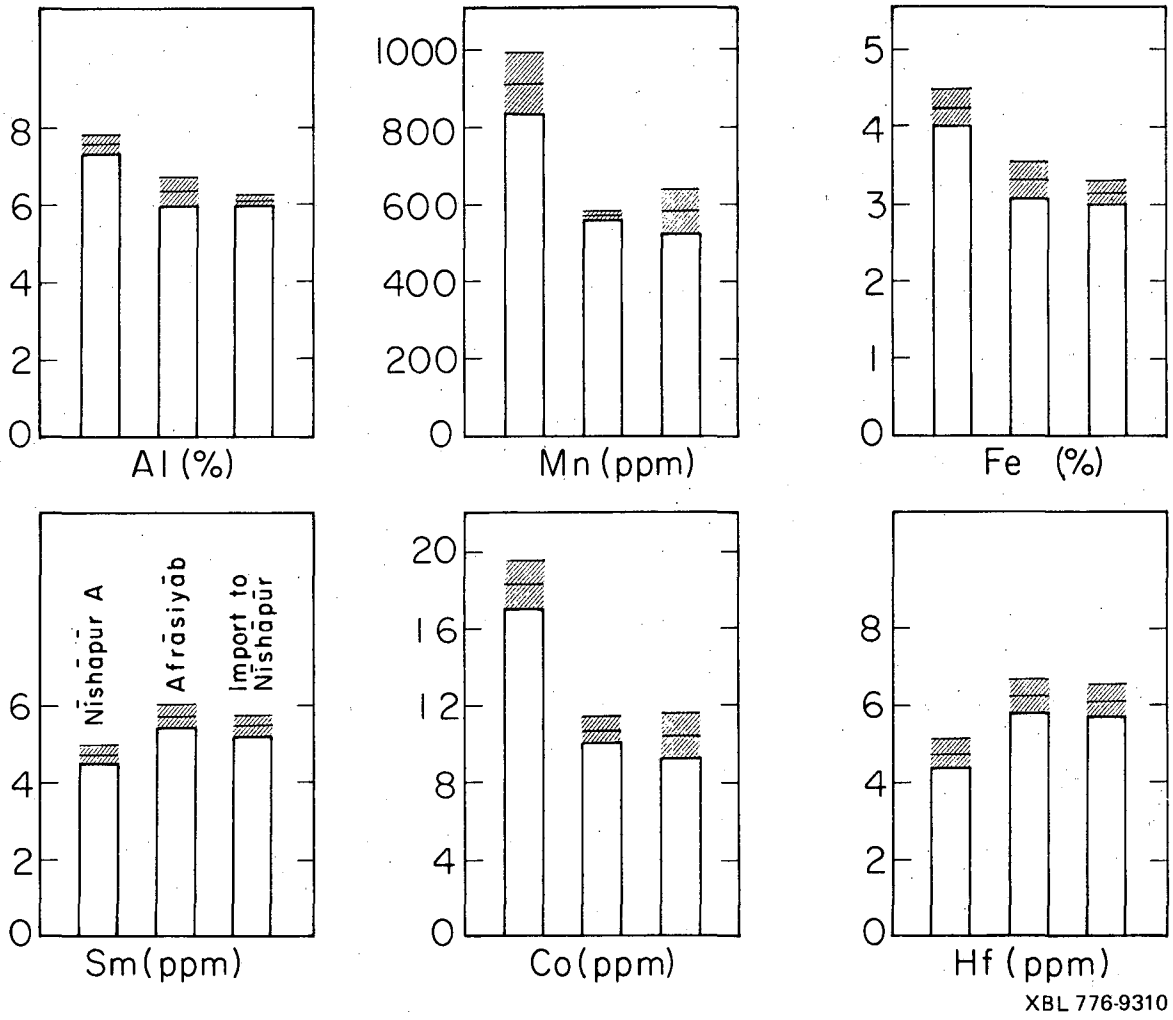

Fig. 7

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