

## CHRONOLOGICAL VARIATION IN CRUCIBLE TECHNOLOGY AT BAN CHIANG: A PRELIMINARY ASSESSMENT

William W. Vernon

MASCA University Museum, University of Pennsylvania, Philadelphia PA, 19104, USA

### ABSTRACT

*An analysis of select attributes of 87 crucible fragments from Ban Chiang and a total of ten from Ban Tong, Don Klang, and Ban Phak Top was made to determine the possible correlation between attributes and the relative chronology for Ban Chiang. Attributes examined for this purpose are temper, rim shape and lagging. Studies were made primarily with petrographic and binocular microscopes. The placement of some fragments in a chronological stage may be approximate since an assessment of disturbances and resultant displacement of fragments has yet to be specified. Therefore, the results at this time can be considered suggestive rather than conclusive for the areas examined.*

### ATTRIBUTES

Crucible fragments from the major Ban Chiang temporal phases (Table 1) are divided into three categories; body, rim and spout pieces. Two whole crucibles and a 3/4 bowl-shaped piece are included in the corpus. Rim shape is divided into two categories; tapered (R1) and rounded (R2). This classification was established for the Phu Lon crucibles (Vernon 1988) and is appropriate for use here. Tapered rims taper to a thin edge and are curved and wedge-shaped in cross section. Rounded rims are broadly rounded at the rim and the thickness is rather uniform throughout the piece. Tapered rims are found on all spout pieces and spouts, and this is the most likely shape for pouring purposes. We know from whole examples that tapered rims can be found around the entire circumference of the crucible. Rounded rims may be parts of bowl-

shaped crucibles with short tapered spouts, or more likely, completely bowl-shaped and serving as holding crucibles for small amounts of smelted or melted metal. We have an example from historic levels at Ban Chiang of a whole bowl-shaped crucible with a rounded rim, but so far no example of a similar crucible with a tapered rim. Rounded rims constitute a much smaller fraction of rim fragments.

The most common temper in the Ban Chiang specimens is rice chaff (Table 2). It occurs alone or with one of the following: organic matter leaving small bean-shaped impressions, quartz, minor amounts of other minerals, clay or grog, and slag. The bean-shaped organic matter may occur alone, or with a minor amount of rice chaff or clay/grog. Clay or grog occurs alone in a few specimens. The paste in most fragments is quartz-rich, showing little semblance of a bimodal distribution. Also, sponge spicules and fragments as well as pieces of laterite are common constituents.

Lagging is present on the majority of specimens. It consists of a very quartz-rich layer that ranges in thickness from a small thin remnant to a layer several millimetres thick. In a few cases there are two or three layers with slag/dross separations. The quartz has a clay binder but was not bonded to the crucible surface, which made it more susceptible to weathering processes. Some fragments, currently without evidence of lagging might once have been lagged. Quartz for the lagging in the Ban Chiang specimens seems to have been derived from washed clay. The signatures for quartz grains in the clay include specific colours, iron oxide inclusions, and distinctive shapes and sizes, all of which appear in the lagged layer of the majority of specimens. Slag or dross appears in minimal to appreciable amounts in or on the surface of

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Table 1: Temporal distribution of Ban Chiang crucible fragments

Period	Body	R 1	Rims		Spouts	Whole*	Total
			R2				
Late	05	02	00		01	00	08
Middle Late	04	04	01		04	00	13
Middle	18	16	03		05	02	44
Early Middle	08	03	04		00	00	15
Late Early	00	00	00		02	01 +	03
Early Early	03	01	00		00	00	04
Total	38	26	08		12	03	87

\* Includes two whole crucibles and one 3/4 bowl piece.  
+ 3/4 bowl piece.

Table 2: Temporal distribution of temper in Ban Chiang crucible fragments

Temper	Early	Late	Early	Middle	Middle	Late	Total
	Early	Early	Middle		Late		
Rice chaff	03	03	11	28	10	08	63
R. Ch. w/organic	-	-	01	01	-	-	02
R. Ch. w/mins.	-	-	01	06	-	-	07
R. Ch. w/clay	01	-	-	01	-	-	02
R. Ch. w/slag	-	-	-	-	03	-	03
Organic	-	-	-	02	-	-	02
Organ. w/R. Ch.	-	-	-	01	-	-	01
Organ. w/clay	-	-	-	-	01	-	01
Clay	-	-	02	01	02	-	05
?	-	-	-	01*	-	-	01
Totals	04	03	15	41	16	08	87

\*Whole crucible in exhibit.

almost all lagged pieces, and also on most pieces which have not been lagged (Table 3).

#### THE BAN CHIANG CRUCIBLES

The largest number of crucible fragments occurs in the Middle Period, and most are from the vicinity of a casting hearth in the Middle Period levels. The smallest numbers occur in the Early Early and Late Early Periods.

There is a gradual increase in numbers towards and decline away from the Middle Period (Table 1).

Rice chaff is the predominant temper in the corpus, and in all periods. Its frequency very nearly mirrors the abundance of fragments for each period. Variations occur only in the Early Middle and Late Middle Periods. Rice chaff with minerals, and clay or grog, are the dominant variants. Small amounts of slag are present in the paste of

Table 3: Temporal distribution of crucible lagging and slag/dross deposits

Period	Fragments Lagged	Not Lagged or Indeterminate	With Slag/Dross
Late	07	00	06
Late Middle	10	03	12
Middle	30	13	37
Early Middle	09	06	15
Late Early	02	01	03
Early Early	02	02	04
Totals	60	25	77

Table 4: Temporal distribution of the Ban Chiang Survey Area crucible fragments\*

Spec. No.	Period+	Type	Temper	Slag/Dross/Lagging
BT 1	Middle	Body	Clay & R. ch.	1
BT 5	L. Early	Rim-R2	Clay & R. ch.	1
BT 3	L. Early	Rim-R2	Clay & R. ch.	1
BT 4	L. Early	Body	Clay & R. ch.	1
BT 2	E. Early	Rim-R1	Clay & R. ch.	1
DK 9	Post Late	Body	Rice ch.	1
DK 8	Late	Rim-R2	Rice ch.	1
DK 7	Late	Body	Rice ch.	1
BPT10	L. Early	Body	Clay	1
BPT1 1	E. Early	Body	Quartz	1

\*BT=Ban Tong, DK=Don Klang, BPT=Ban Phak Top  
+E=Early, L=Late

many fragments, and slag is significant as a secondary temper in three of the Late Middle Period fragments.

Many fragments have sponge spicules and diatoms were found in a few. This suggests a clay source from one or more areas that had ponded water.

At Ban Na Di a clear change in crucible temper from predominantly clay to predominantly rice chaff was noted in layer 6 (Higham and Kijngam 1984). Clay tempered crucibles outnumber rice chaff tempered ones by at least 3:1 in levels 8 and 7. The higher levels 6 and 5 have almost exclusively rice chaff tempered fragments. This

transition is equated to the end of the Middle Period at Ban Chiang. There is no comparable transition at Ban Chiang, where rice chaff predominates throughout the sequence and clay appears sporadically.

#### SURVEY AREA CRUCIBLES

The five Ban Tong fragments ranging from Early Early to the Middle Period all have a combination of clay and rice chaff as temper. This combination is present in only two of the Ban Chiang fragments, one from the Early Early Period and one from the Middle Period. There is a

temporal similarity here, but the low percentage of Ban Chiang specimens makes any conclusion based on similarity rather tenuous. There is a suggestion, however, that Ban Tong had a local crucible technology that differed somewhat from its neighbour, Ban Chiang.

The three Don Klang fragments are Late to Post Late Period in age and all have rice chaff temper. There is a very general correlation with the Ban Chiang crucibles which are dominated by rice chaff as temper. Again, the sample is too small for drawing any firm conclusions.

The two Ban Phak Top fragments, one tempered with clay and the other with quartz, are different in temper from the above but the sample is far too small to work with. However, prior to the Late Period there is a hint here that sites might have varied in local crucible technology with respect to the use of temper (Table 4).

The practice of lagging seems to be universal in northeastern Thailand and therefore of little use for correlation purposes.

#### OTHER CONSIDERATIONS

The Phu Lon crucibles (Vernon 1988), consisting of 96 fragments, have crushed or decomposed rock as temper in most fragments and differ markedly in this respect from the Ban Chiang, Ban Tong, Don Klang and Ban Phak Top crucibles. The age of the Phu Lon crucibles is equivalent to the Middle Period of Ban Chiang. The Phu Lon fragments reflect to a large extent the local geology.

The differences in temper now noted from several sites, some of a similar age, suggest that the choice of temper might have had more to do with local environmental considerations than with choice on the basis of perceived technological advantages. For example, a change in temper could also reflect the exhaustion of a supply or a move to another local but more accessible supply of a different material. It does not necessarily reflect a change based on technological considerations. In any case, the correlation of temper with local environmental parameters seems to be a logical starting point for the use of crucibles in regional correlations. Without knowing more about each site the use of these particular artifacts for correlation purposes where chronological variations are indicated seems to have limitations and can only be suggestive in the broadest sense.

#### REFERENCES

- Higham, C.F.W. and A. Kijngam. 1984. *Prehistoric Investigations in Northeastern Thailand*, Parts I-III. Oxford: BAR International Series 231 (i-iii).
- Vernon, W. W. 1988. The crucible in copper/bronze production at prehistoric Phu Lon, northeast Thailand: analyses and interpretation. To be published in the proceedings of the Conference on Ancient Chinese and Southeast Asian Bronze Age Cultures, Kioloa, New South Wales, 8-12 February 1988.