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Summary

Analytical results for 69 Roman brooches are presented and discussed. 26 are quantitative and were obtained by AAS; the rest are qualitative, XRF data. The applied decoration on the brooches is also described.

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A total of 75 brooches and brooch fragments were submitted for examination and analysis. All those that were large and solid enough had metal samples drilled from an inconspicuous place. The sample holes (which were about 1 mm across) were left unfilled. The metal samples were analysed quantitatively by atomic absorption (AA) using essentially the method described by Hughes et al (1976). The results are given in the Table where an alloy name has been assigned to each object on the basis of the amounts of the three main alloying elements present. The Figure shows the relationship between composition and alloy name; the nearer you are to a corner, the higher the proportion of that element present. Alloy names such as 'bronze/gunmetal' denote intermediate compositions and '(leaded)' alloys contain less lead than 'leaded' ones though the metal is still present at more than a few percent.

All the brooches were also analysed non-destructively by energy dispersive X-ray fluorescence (XRF) which provided qualitative results. The quantitative AA results were used to approximately calibrate these and the resulting alloy names are to be found in the Table where they are marked with an asterisk. A few fragments which were mainly pieces of pin/springs were not analysed and do not appear in the Table.

Discussion of analytical results

The analyses reported here were carried out as part of a project investigating the composition of late Iron Age and Roman copper alloys; some 2500 brooches and a considerable number of other objects have been analysed. This work has shown that each brooch type had one alloy or a narrow range of related alloys of which it was normally made. There are a minority of types which do not conform to this pattern and some which are relatively rare and for which there are thus insufficient analyses to give an overall pattern. Some preliminary results have been published or are in press (Bayley and Butcher 1981, Bayley forthcoming, Bayley and Butcher forthcoming), groups of analyses from specific sites have been published (eg Bayley 1985A, Bayley 1988) and a full presentation is planned.

The results for the brooches from Tiddington are given in the Table; in general they conform to the expected patterns as the comments

below show.

About two thirds of all Nauheim derivative brooches are bronze so the composition of the examples here (Nos 1-3) are not unexpected. Other simple brooches without arms are also often bronzes (eg No 36).

Many 1st century brooch types, both those in use in Britain just before the Claudian conquest and those brought in by the legions, are normally made of brass. Examples include eye brooches (No 11), one-piece Colchesters (No 5), all the Aucissa, Bagendon and Hod Hill series (Nos 4, 6-10, 39 and 56) and those brooches with cylindrical heads enclosing a spring such as Rosettes and Langton Downs (Nos 32-4). Some of these types are made of very pure brass but others contain small amounts of tin, or sometimes even enough tin to re-classify the alloy as a gunmetal. This happens most frequently among the types mentioned above with the Hod Hill and Langton Down brooches (Bayley forthcoming).

In the later 1st century there appears to be a sudden change from brass to leaded bronze as the normal alloy for brooches. This can be seen most clearly with the Colchester brooches where the change in alloy goes hand in hand with the change from one-piece to two-piece construction (Bayley 1985B). Other types commonly made of leaded bronze are Colchester derivatives (including Dolphins) and Polden Hill brooches. The examples of these type from Tiddington (Nos 13-21 and 23-31) are mainly leaded bronzes though some are unleaded and others contain more than a trace of zinc and are described as bronze/gunmetal. These compositions are not unique as although 70% of these types are leaded bronze, 15% are bronze and 10% gunmetals, both with and without lead. There are very few made of brass and the one example of this composition here (No 24) is typologically atypical.

Other brooches of later 1st-2nd century date, such as the T-shaped brooches most commonly found in the south west, Aesica brooches and also many of the varieties of trumpet brooch, are normally made of leaded bronze (Nos 35, 37-38, 40-42, 46-54 and 58). Note that although No 35 has superficial similarities to Nos 32-4, its hinge mechanism and composition mean it fits better with this group.

More highly decorated brooches such as headstuds (Nos 44-45) are found in a wide range of alloys, mainly unleaded ones. Brooch No 22, with its now lost decoration, would best fit here on analytical grounds. Plate-on-bow brooches of types that often have a trumpet head (Nos 55 and 61) are usually brass or other zinc-rich alloys.

Penannulars (Nos 64-71) are normally made of unleaded alloys,

and brasses, bronzes and gunmetals are all common. This is usually the only Roman brooch type for which unalloyed copper is used, though it is not common.

Description of applied decoration

Many of the brooches have traces of applied decoration of one sort or another. One of the fantail brooches (No 12) and four of the Hod Hill brooches (Nos 6, 7, 9 and 56) carry traces of tinning which is found on many similar brooches. No 56 also has traces of a black inlay, almost certainly niello, which is uncommon but not unknown on brooches of this type. Although Nos 41 and 46 have a white metal surface they are unlikely to have been deliberately tinned; this uniform appearance is most likely to have been an accidental by-product of corrosion processes.

Many of the T-shaped, headstud and plate brooches and one trumpet brooch are enamelled. In many cases this is too deeply corroded for definitive statements on its original appearance to be made. All were examined under x10-x30 magnification and the following notes summarise what was visible:

40 The upper part of the bow has two parallel, rectangular fields of enamel, each containing four juxtaposed blocks in two alternating colours. One now appears dark green which may possibly be the original colour while the other, which now appears a pale olive green, was originally opaque orange (traces of undecayed enamel are visible).

41 Traces of enamel which now look greenish (not its original colour) survive in the two studs on the bow and in two parallel, irregular fields between them.

44 Eleven separate rectangular cells along the bow contain the remains of deeply decayed enamel of more than one colour, probably two alternating colours. One colour may originally have been opaque red.

45 The bow has a single rectangular field with six blocks of juxtaposed enamel of more than one colour. It is all very badly decayed but one colour was probably originally opaque red. No enamel survives in the headstud.

46 This poorly cast brooch has five pairs of small triangular cells on the lower part of the bow containing enamel which is now mid green. This may or may not be its original colour.

52 The bow has two parallel rectangular fields, each containing six juxtaposed blocks of enamel in two alternating colours. These now

appear dark and pale green and originally were probably opaque red and opaque orange respectively.

55 The three triangular fields on the fantail foot would originally have contained enamel though none survives. The six similar fields on the disc probably also contained enamel but this area of the object is obscured by (?)corrosion products.

59 The shape of the fragment suggests this brooch would originally have been enamelled.

60 The two outer fields contained blue enamel and that in the inner, D-shaped cells may have been white.

61 Each wing of this insect brooch was covered with opaque blue enamel; the spots are reserved metal.

62 The four spots along the horse's flank are filled with enamel. Counting from the front, the first and third spots were blue but the others are now dark and much decayed so an original colour cannot be reliably suggested.

Other forms of decoration are also represented. No 22 has numerous recesses, each of which would have contained inlay, possibly held in position by a decorative rivet, though none survives. No 52 has an applied metal foil soldered to the tab below the headloop in addition to enamel. The metal looks white but XRF analysis failed to detect any silver (the common metal applied in this way) and instead suggested it was a tin-rich alloy.

No 50 is a hollow casting, unlike the other trumpet brooches. It is far larger than them and this technical innovation may have been necessary to reduce its weight so it was usable.

Acknowledgements

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Table of analytical results

Key to codes for applied decoration:

W = tinning (white metal coating)

N = niello

A = applied metal foil

E = enamel

\+ = rivetted-on decoration now lost

? denotes uncertainty

Cat No	Cu%	Zn%	Sn%	Pb%	Decor	Alloy
1						* bronze
2						* bronze
3	87.7	3.5	6.8	0.5		bronze/gunmetal
4					W	* brass/gunmetal
5						* brass
6					W	* bronze?
7						* brass
8						* brass
9					W	* brass
10						* brass/gunmetal
11						* gunmetal
12	77.0	15.9	2.4	1.5	W	brass
13						* bronze/gunmetal
14						* leaded bronze/gunmetal
15						* (leaded) bronze?
16						* leaded gunmetal
17						* leaded bronze
18	70.6	9.3	8.3	0.6		gunmetal
19						not analysed
20						* (leaded) bronze
21						* leaded bronze/gunmetal
22	79.8	12.5	2.0	6.0	+	(leaded) brass
23	87.8	2.1	14.5	0.5		bronze
24						* brass
25	89.6	0.2	13.0	1.3		bronze
26	69.2	0.2	8.0	20.0		leaded bronze
27	86.3	0.1	10.6	8.0		leaded bronze
28						not analysed

Cat No	Cu%	Zn%	Sn%	Pb%	Decor	Alloy
29	79.9	0.5	9.9	6.4		(leaded) bronze
30	73.2	0.4	12.9	20.2		leaded bronze
31						* leaded bronze/gunmetal
32						* brass/gunmetal
33	76.1	16.9	2.1	0.5		brass
34						* (leaded) brass
35						* (leaded) bronze
36						* bronze
37	73.3	0.0	8.2	18.5		leaded bronze
38						* leaded bronze
39						* brass
40	78.8	0.4	8.9	13.3	E	leaded bronze
41	75.7	0.1	12.3	12.5	E	leaded bronze
42						* (leaded) gunmetal
43						* gunmetal
44	83.2	4.4	8.2	1.4	E	bronze/gunmetal
45	78.9	11.0	7.4	0.1	E	gunmetal
46	82.5	3.2	8.5	8.5	E	leaded bronze/gunmetal
47	69.1	0.6	9.2	24.2		leaded bronze
48	63.6	0.3	11.4	24.8		leaded bronze
49	81.4	0.2	8.3	6.8		(leaded) bronze
50	59.9	0.0	15.6	16.7		leaded bronze
51	75.0	0.2	12.6	12.4		leaded bronze
52	75.9	0.7	13.7	14.3	EA	leaded bronze
53						* leaded bronze
54						* leaded bronze
55					E	* brass
56					WN	* brass
57						* leaded gunmetal
58	71.3	0.6	7.7	19.6		leaded bronze
59					?	* leaded bronze
60					E	* gunmetal
61	80.4	14.3	7.1	1.4	E	gunmetal
62	70.3	8.3	7.2	9.1	E	leaded gunmetal
63						* leaded bronze
64						* bronze/gunmetal
65						* bronze/gunmetal
66						* bronze

Cat No	Cu%	Zn%	Sn%	Pb%	Decor	Alloy
67						* brass
68						* copper
69						* bronze/gunmetal
70						* brass
71						* leaded gunmetal

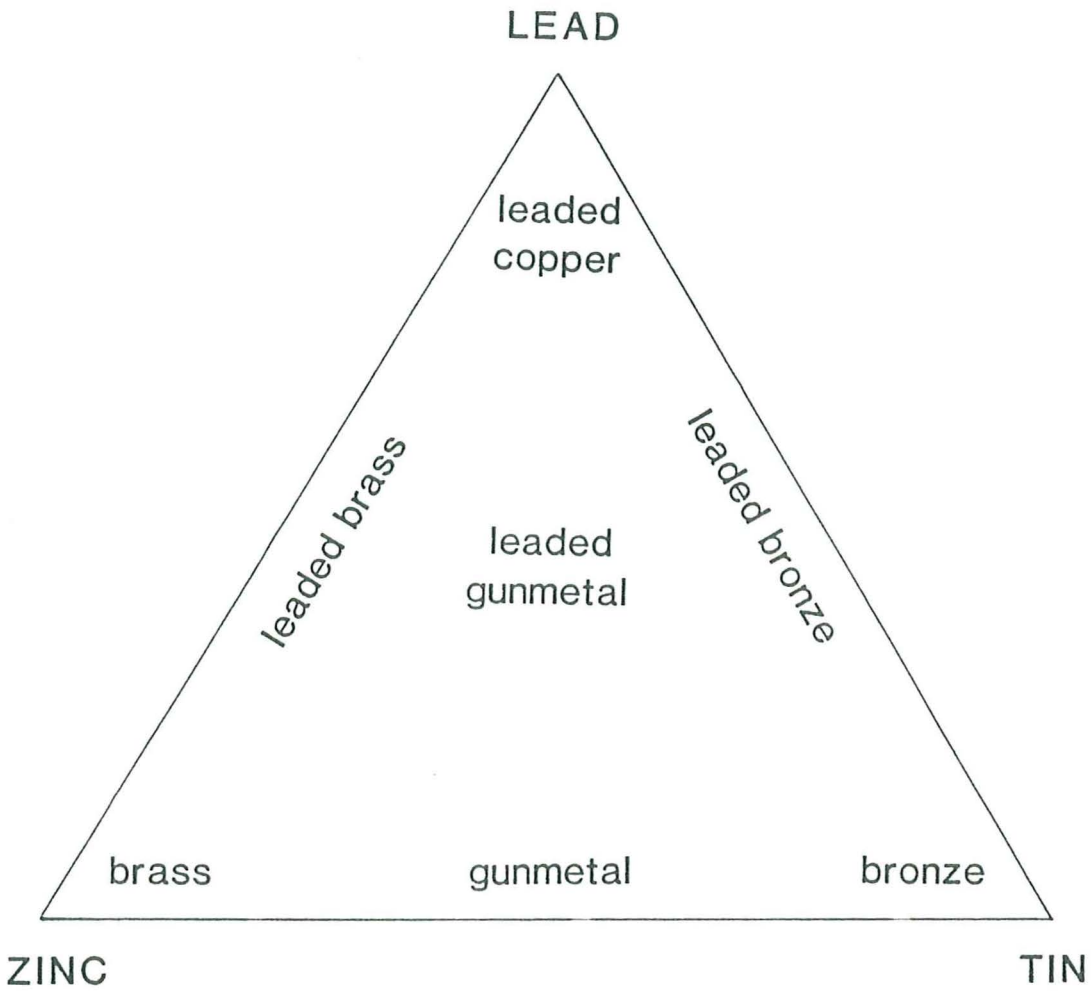

Diagram showing the relationship between

composition and alloy name