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Examination of Technological Material from Tiddington,
Warwickshire

Paul Wilthew
Ancient Monuments Laboratory

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Several samples (AM840974-93) of possible metalworking waste from Tiddington Roman Settlement were examined. Where appropriate qualitative elemental analysis was carried out using energy dispersive x-ray fluorescence (X.R.F.) and the compounds present in some samples were identified using powder x-ray diffraction (X.R.D.). The analytical results and identifications of each sample, which are discussed below, are given in the appendix.

The bulk of the material consisted of dribbles and lumps of copper alloy with various compositions. The dribbles of metal were almost certainly waste from casting copper alloys. The remaining pieces may also have been waste from copper alloy working but this could not be confirmed from their appearance. The analytical results (see appendix) suggested that most of the metal fragments were bronze (copper-tin alloy) although some may have been copper or gunmetal (copper-tin-zinc alloy). Lead was present in some cases, and it is quite probable that some of the samples were deliberately leaded.

One sample (AM840976) was almost certainly used in non-ferrous metal working, probably silver refining. This would be consistent with the high levels of lead and traces of silver detected in the sample which was shown to include substantial amounts of cerussite (lead carbonate) by X.R.D..

A few small pieces of iron slag were also present. These were almost certainly iron smithing slag but such small quantities are not significant.

Several samples of a mineral which contained copper and arsenic were found. They were analysed using X.R.D. and were found to consist largely of cuprite (Cu_2O) and malachite ($\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$). This material would have been suitable for use as copper smelting ore but there was no direct evidence that it was intended for that use. The presence of this material is probably not significant, particularly as only one of the samples came from a properly stratified context.

Although the material probably does represent waste from various metalworking activities, including casting of copper alloys, non-ferrous metal refining and blacksmithing, the amount of material was small and most of the samples were not from well stratified contexts. Therefore no further conclusions can be drawn from this material.

Appendix - Analytical Results and Identifications

AM No.	S.F. No.	Elements* Detected	Identification**
840974	126	<u>Cu</u> , Pb	Corroded copper
840975	236	<u>Cu</u> , (Pb, As)	Dribble of copper
840976	499	<u>Cu</u> , <u>Pb</u> , Ag, Sn	Material associated with non ferrous metal working (possibly silver refining). The major mineral present was cerrusite.
840977	718	<u>Cu</u> , Sn (Pb)	Corroded bronze
840978	722	<u>Cu</u> , Sn, (Pb)	Dribble of bronze
840979	783	<u>Cu</u> , (Pb)	Dribble of copper
840980	881	<u>Cu</u> , (Pb, Ag)	Dribble of copper
840981	879	<u>Cu</u> , Sn, (Pb)	?Dribble of very corroded metal
840982	887	<u>Cu</u> , Pb, Sn, (Zn)	Metal lump
840983	925	<u>Cu</u> , Pb, Sn	Fragments of copper alloy
		<u>Cu</u> , Pb, Zn, Sn	with various compositions.
		<u>Cu</u> , (Pb)	One piece of iron slag.
		<u>Cu</u> , (Pb, Ag)	
		<u>Cu</u> , Sn, (Pb)	
840984	1058	<u>Cu</u> , Pb, (?Sn)	Dribbles of copper and bronze
		<u>Cu</u> , Zn, <u>Pb</u> , <u>Sn</u>	
		-	Iron smithing slag, charcoal, stones
840985	67	<u>Cu</u> , As, (?Pb)	Mineral, major components malachite and cuprite
840986	50	<u>Cu</u> , As, (?Pb)	As AM840985
840987	55	<u>Cu</u> , As, (?Pb)	As AM840985
840988	96	<u>Cu</u> , As, (?Pb)	As AM840985
840989	130	<u>Cu</u> , As, (?Pb)	As AM840985
840990	302	<u>Cu</u> , Sn, (Pb)	Dribble of bronze
840991	M770	<u>Cu</u> , Pb, Sn, (Sb)	Dribble of bronze
840992	M741	<u>Cu</u> , Zn, Pb, Sn	Inhomogeneous mass including copper alloy
840993	M739	<u>Cu</u> , As, (Pb)	As 85

* Major elements underlined, trace elements in parentheses

** Some, at least, of the copper alloys which contained lead may have been deliberately leaded.