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REPORT ON THE SLAGS AND OTHER METALLURGICAL FINDS FROM TRETHURGY, CORNWALL

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The slags (AM Nos. 777381-407) were examined and individual identifications are given in the table, below. The total weight was only a few kilogrammes. A tin ingot (AM 777408) and some silver (AM 777859) were also examined.

The two largest groups of material were hearth lining and smithing slag. The hearth lining was red fired clay that had become vitrified on one surface from contact with the fire. The pieces were of various thicknesses indicating differing firing intensities. There is nothing in the hearth lining to associate it with a particular process but the presence of the smithing slag suggests that these hearths were used by blacksmiths working iron. The smithing slag is the sort of material one would expect to find on any settlement where small scale ironworking was carried out, presumably to meet the local demand. Much of this slag had attached pieces of charcoal or impressions of charcoal, the remains of the fuel used in the hearth where the iron was being heated.

The other "slags" are fired clay (AM 777397 and 777400), vitrified clay (AM 777394) which is just clay that has been overheated, possibly rock or a mineral (AM 777390-91) which are being further investigated, a piece of brick or tile with a vitrified surface (AM 777387) which may have been built in to a hearth and vitrified like the hearth lining and one piece of iron slag with a rather different structure to the rest (AM 777385). It appears to have been more fluid that the rest of the slag and maybe even to have run a little. This sort of structure is more usually associated with iron smelting where temperatures are higher than in smithing operations but in this case was probably just the product of a smithing hearth where the temperature obtained was higher than normal.

The total quantities of slag were small and almost certainly only represent small scale working, not a large industry.

The silver (AM 777859) was qualitatively analysed by x-ray fluorescence (XRF). The major element present was silver but minor amounts of copper, zinc, lead and gold were also detected. The composition of both pieces was similar. The metal appears to have been spilt on an uneven surface while molten.

The tin ingot (AM 777408) was originally roughly circular and plano-convex in shape. The thinner outer portion has broken up into blocky lumps as it corroded leaving a central piece which measures about 22 x 15 cms and has a maximum thickness of 7.5 cms. The weight of the main piece is about 7 kgs while the fragments weigh about 5½ kgs.
It is not possible to estimate accurately the original weight of the ingot as much of the tin is now present as tin oxide, which increases the apparent weight while not all the pieces that have fallen off the ingot may have been retrieved which would reduce the apparent weight. A fragment of the ingot was analysed by XRF but the only elements detected apart from tin were iron and manganese, both almost certainly in the adhering soil. The analysis agrees with those quoted by Tylecote (1962, 66) who notes that tin ingots are usually better than 99% tin. The metal would have been obtained by smelting cassiterite (tin oxide) at a temperature of around 600°C (Tylecote 1962, 63).

Reference:

R F Tylecote (1962) Metallurgy in Archaeology.

TABLE: SLAG DESCRIPTIONS/IDENTIFICATIONS

AM No.	Hearth lining	Smithing slag	Other
777381	+		
777382		+	
777383		+	
777384		+	
777385			Iron slag that has ?flowed
777386		+	
777387			Piece of brick or tile with vitrified surface
777388			(No sample in bag)
777389		+	
777390			) ?Possibly rock or mineral
777391			)
777392		+	
777393		+	
777394			Vitrified clay
777395		+	
777396		+	
777397			Black fired, coarsely gritted clay lump ?
777398		+	
777399	+		
777400			?Iron object and coarsely gritted burnt daub
777401	+		
777402	+	+	
777403	+		
777404	+		
777405	+		
777406	+		
777407	?		

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REPORT ON SOME SLAG-LIKE MATERIALS FROM TRETHURGY, CORNWALL

Amongst the slags and other residues from the site of Trethurgy, Cornwall, examined by Ms.J Bayley (A.M.Lab.), were several specimens (AM.777390-91) that resembled slag but required further investigation to identify them.

A powder sample for X-ray diffraction analysis, and polished specimens for microscopy, were prepared. Both reflected light and scanning electron microscopy were used, the latter including semi-quantitative chemical analysis.

The analyses showed the specimens not to be slags and, therefore it was supposed that they were a natural mineral, possible altered, e.g. due to partial smelting, by man.

Therefore, a thin section was prepared, and along with a polished specimen they were examined by one of us (R.I.). The specimens were identified as Schorlite [$NaFe_3B_3Al_3(OH)_4(Al_3Si_6O_{27})$] a form of Tourmaline, a common accessory mineral associated with tin mineralization. Schorlite is closely associated with Cassiterite [S_nO_2, tin ore] such that it may have been necessary to sort the two minerals after mining. The presence of both Schorlite and a tin ingot (AM.777408) (AM.777408) on the site would suggest that tin smelting had occurred on, or very close to the site.

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Note: The failure to identify the mineral initially from the chemical analysis and the X-ray diffraction pattern was due to the inability of the scanning electron microscope to detect the element Boron (B), thus resulting in a search through Na/Fe/Al silicates, rather than Na/Fe/Al/B silicates.