

Abstracts

BRITAIN AND IRELAND

J Bayley. Roman non-ferrous metalworking in southern Britain. In D Bird (ed), *Agriculture and industry in south-eastern Roman Britain*. Oxford: Oxbow Books, 2017, 330-345.

During the Roman period copper and its alloys, gold, silver, lead, tin and pewter were all used to make a wide range of decorative and utilitarian objects. While some of these objects were made in other parts of the Roman Empire there is a growing body of evidence for production in Britain. The processes used to turn both newly smelted and recycled metals into objects are outlined, and the archaeological finds which provide evidence for these processes described. Assemblages of metalworking finds from sites across southern Britain are used as case studies to show how archaeological finds can be interpreted to give a broader picture of the place of metalworking in Romano-British society.

EUROPE

F Ertl, S Strobl and R Haubner. An ancient bronze ingot smelted from fahlore. *Materials Science Forum*. 891, 2017, 613-617.

The original surface of the bronze bun ingot fragment was covered by dark green corrosion products and shrink holes are visible. XRF analysis confirms Cu as balance, up to 4 wt% As, 2.5wt% S and smaller amounts of Sb, Ni, Fe, Ag. This composition suggests that fahlores were processed. An inhomogeneous microstructure was observed, caused by the alloying elements and their segregation during solidification of the melt. The microstructure is dominated by copper dendrites and the interdendritic regions are enriched with the residual alloying elements. Near the ingot surface large oxide crystals were observed indicating oxide formation during the solidification of the melt. The ingot is arsenic bronze with quite a complex microstructure.

E Figueiredo, A Lackinger, B Comendador Rey, R J C Silva, J P Veiga and J Mirão. An experimental approach for smelting tin ores from Northwestern Iberia. *Materials and Manufacturing Processes* 32(7-8), 2017, 765-774.

Microstructural and chemical analysis of tin and slag resulted from three smelting experiments reconstructing prehistoric conditions are presented. Cassiterite ores were collected from northwestern (NW) Iberian deposits and were smelted in a small open pit. Results show that the loss of tin can be very high, up to 80%, mainly as a result of volatilization of the tin species. The experiments show that using handmade leather bag bellows and clay tuyères, temperatures can easily reach >1200°C. The tin

produced was a very pure (Sn) solid solution, with the presence of dispersed inclusions or phases of various compositions. These included FeSn and FeSn₂ intermetallics and small metallic W inclusions. Slags could be grouped into three types based on their physical characteristics, and bulk chemical analysis identified each type as being a product of the reaction of ore material or a product of the reaction with the crucible material. Generally, it was found that in spite of very low recovery rates, the tin produced by this simple technique would have been adequate for a domestic small-scale production.

A Hauptmann, G Schneider and C Bartels. The shipwreck of Bom Jesus, AD 1533: Fugger copper in Namibia. *Journal of African Archaeology* 14(2), 2016, 181-207.

The Portuguese vessel *Bom Jesus* sunk off the coast of Namibia on its way from Lisbon to India; it contained naval equipment and commodities for trade. Amongst the materials recovered were 1845 copper ingots, showing the trademark of the Fugger company from Augsburg, Germany. Historical accounts testify to massive copper and silver production of the Fugger-Thurzo company in the area of Neusohl in the Slovak Ore Mountains. Analyses of 60 of the ingots show a very homogeneous composition with appreciable concentrations of lead, silver, antimony, nickel, and arsenic indicating the smelting of fahlores. Lead was added deliberately to the copper to extract silver by the liquation process. This technological innovation is one of the numerous hallmarks of the Renaissance period. Lead isotope ratios point to an origin from lead deposits in Cracow-Silesia. The ore districts of Neusohl and Cracow-Silesia were intensively connected to mining and metal production during the post-medieval period.

A Jouttijärvi. Roman alloying practice. *Materials and Manufacturing Processes* 32(7-8), 2017, 813-826.

On the basis of a large number of published and unpublished analyses of Roman artefacts, the alloying traditions used in the production of a number of types or groups of objects are discussed. For each group only a limited number of fairly well defined alloys were used, probably depending on the manufacturing technique used, the colour of the metal and its mechanical properties. Three main types of bronze and two types of brass are identified. Leaded bronze was produced by addition of lead to a well-defined bronze, and leaded gunmetal by mixing the leaded bronze with brass.

S Merkel. Carolingian and Ottonian brass production in Westphalia. Evidence from the crucibles and slag of Dortmund and Soest. *Metalla [Bochum]* 22(1), 2016, 21-3.

The new crucible and slag finds from excavations in Dortmund have revived the discussion of Westphalian brass cementation technology in the Carolingian and Ottonian periods. Metallic