

Agricola and Zwickau: theory and practice of Renaissance brass production in SE Germany

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ABSTRACT: The technology of brass production in the Renaissance has received only little attention so far. This paper concentrates on late 15th-century brass production by studying crucibles recovered in Zwickau (SE Germany). Their scientific analysis by optical microscopy, ED-XRF and SEM-EDX is presented in conjunction with a little known text on brass making written by Agricola in the mid 16th century. As a result, two main crucible types are defined: one big lidded pot used for brass making via cementation, and one smaller triangular vessel used for the melting and casting of the fresh brass produced in the former type. The particular compositional characteristics and slag remains identified in each type of ceramic (big crucibles, lids, and small crucibles) are discussed in the light of their specific function and the diverse technical requirements that they had to meet. All in all, the archaeological picture almost exactly matches Agricola's account, while it adds further information as to the technical details of the brass making process.

Introduction

The history of brass is relatively well known in its origins, spread and uses. The early stages of brass up to the Roman period have been intensively studied by using both literary information and analytical data (Forbes 1950, Caley 1967, Craddock 1978, Bayley 1984 and 1988, Dutrizac and O'Reilly 1989, Picon *et al* 1995, Rehren 1999a). After a peak in the use of brass during the 1st century AD and a subsequent decline (Caley 1967, Dungworth 1996), the production of brass in Europe experienced a sudden resumption during the Middle Ages, possibly as a result of Eastern influences rather than a continuation of the Roman tradition (Rehren 1999b). Soon it was to become the most common copper alloy, used for architectural and luxurious items, for lay and ecclesiastical furniture and for technical and domestic implements. This is true up to the present day, with the main areas of brass production throughout the Middle Ages and the Renaissance being in Central Europe (de Ruelle 1996, Day 1998).

The composition and manufacture of medieval and later brass artefacts are reasonably well studied (Cameron

1974, Craddock 1985, Mortimer *et al* 1986, Caple 1995, Bayley 1996, de Ruelle 1996, Pollard and Heron 1996: 196–238, Eniosova 1999). Others have concentrated on the production of brass chiefly based on contemporary treatises (Zacharias 1989, Day 1998). However, archaeological evidence of brass production during the late Middle Ages and particularly the Renaissance is still scarce (but see Rehren *et al* 1993 and Rehren 1999b for examples of medieval brass-making remains).

The present paper aims at contributing to fill this gap. The study focuses on metallurgical debris attributed to brass production from late 15th-century Zwickau in SE Germany in conjunction with a little known, roughly contemporary, treatise on brass making by Agricola.

The metallurgical remains from Zwickau

The Zwickau material comes from a rescue excavation directed by J Beutmann, carried out within the medieval area of the city during 1998 (Fig 1). A comprehensive presentation of the results of the recent excavations in Zwickau is given in Beutmann *et al* 2000; here we concentrate on the brass making residues. In a 7x7x1m pit, some 3000 fragments of technical ceramic were