



Paper

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The Iron trade: The mapping of European smelting slag and the source determination of iron

Abstract

On the basis of a database containing more than 2000 analyses of well documented iron smelting slags from Europe, it has been possible to map differences in slag compositions. Within Scandinavia and the northern part of Continental Europe at least 15 compositional slag types can be distinguished based on differences in the local geology.

The composition of primary smithing slag and especially the slag inclusions in iron objects makes it possible to estimate the origin of the iron cleaned or worked in a smithy. The origin can probably not be traced to a single production site, but only to broader areas.

The slags from cleaning of blooms are essentially smelting slag, and will therefore resemble the slags from smelting sites, although they will show a reaction with ashes from the charcoal. Slag inclusions in iron artefacts will resemble the bloomery slags even more, as they have to a large degree been shielded from reaction with the surroundings by the iron.

The analysis of slag inclusions in more than 200 iron objects found in Denmark is beginning to reveal trends in the production and distribution of iron from the Iron Age to the medieval period. Some of these can be connected to existing knowledge on iron extraction in Denmark, but there may also be shed new light on production in periods where no known archaeological remains of smelting furnaces exist.

Counting hammerscale: The systematic sampling of workshop remains, developments in methods and results

Abstract

During the last years, the application of new systematic sampling strategies and chemical analysis has made it possible to obtain detailed information about the layout and function of excavated workshops.

The physical distribution of slag, hammerscale, charcoal vitrified clay and other types of debris from ironworking can yield information about the structure of the Smithy and the organization of the work within it, whereas the chemical characteristics of slag, hammerscale and slag spheres will tell about the processes used in the workshop.

The work of the blacksmith consisted basically of three different processes: cleaning of bloom iron, welding together pieces of iron and/or steel and the forming of the object. Although

superficially similar, the hammerscale from these processes will have different chemical composition. It is therefore possible, on the basis of chemical analysis, to establish which processes took place within a given workshop.

Analyses of excavated workshops have shown that they can be divided into different categories. One type only showed slight signs of bloom-cleaning and welding. They probably represented farm-smithies where simple tools and fittings were made from available pieces of iron. Other workshops was somewhat more advanced, employing both the bloom cleaning and the smiting of finished objects, although not using welding to any significant extend. A third type of workshop seemingly produced more advanced tools or weapons needing the welding of pieces of iron or steel. Apparently the raw material for these smithies was bar iron, as they only occasionally performed the cleaning of blooms.

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