

News and Short Contributions

The Traditional Use of an Ore Mineral as an Abrasive

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Chalcopyrite (CuFeS₂) was identified as the main constituent of Trent sand, a naturally-occurring abrasive that until the last few years was traditionally employed in the Birmingham (England) Jewellery Quarter for buffing metal. Since chalcopyrite is one of the chief ores of copper and has not heretofore been identified in an abrasive, the possibility exists that excavated particulate chalcopyrite used as a polishing material may be misinterpreted as dressed ore. The same possibility of misinterpretation holds true of blacksmiths' "iron scale" as well.

Introduction

We tend to assume that traditional crafts are only to be found nowadays in the villages and bazaars of the Third World. In fact some crafts survive and continue to be practiced in highly industrialized countries, where they support successful commercial firms. A number of metalsmithing firms of this sort are still to be found in Birmingham, England, in an area of the city known as the Jewellery Quarter.

The St. Dunstan Works of A. Edward Jones Ltd., a firm that manufactures domestic and ecclesiastical silver by traditional methods, is itself located in the Jewellery Quarter, on Pemberton Street. During a visit to the workshops there I observed an abrasive being used to polish silver that caught my attention because of its peculiar color. It did not resemble any of the modern synthetic abrasives familiar to me from metallographic preparation. The color was a shade of grey-green that was neither the neutral grey of silicon carbide (SiC) nor the dark green of chromic oxide (Cr₂O₃).

The craftsmen could not tell me what it was, other than that it was traditionally used, and that it was "river sand."

They were not able to identify for me the river from which it came. The material has since been identified by Michael Constable of the Birmingham Museum of Science and Technology as a product available in commerce until a few years ago called "Trent sand" (Canning & Co., Ltd. 1901: 82, 85, 1960: 45–46), a natural product obtained from the Trent River, which passes within 19 miles north of Birmingham.

Trent Sand

A sample of this abrasive was examined at the Conservation Analytical Laboratory of the Smithsonian Institution. To specify the color a small lump was wetted with water and spread out on a thin, white card to dry, then compared with two sets of Munsell cards (Munsell 1915; Munsell Color Company 1975). The correspondence in the Munsell Color System was 5Y 4/1.

X-ray diffraction was used to identify the minerals present. The major component was the mineral chalcopyrite, CuFeS₂. The principal measured d-spacings of the sample compared with those reported for the mineral chalcopyrite (JCPDS 1986) were, in decreasing order of intensity: 3.0354 vs. 3.038, 1.8546 vs. 1.8570, 1.8692 vs. 1.8697, 1.5920 vs. 1.5927, and 1.5791 vs. 1.5753. In addition a small amount of synthetic silicon carbide was identified, as well as quartz and other minerals; optical microscopy also revealed detritus from silver polishing and an occasional cotton fiber from the buffing wheel.

Chalcopyrite is an ore mineral; specifically it is an important ore of copper. For that reason, identifying chalcopyrite as the chief component in an abrasive was completely unanticipated, nor is this workshop practice reflected in the archaeological literature. Abrasives reported from archaeological excavation are generally in the form of stones, chiefly touchstones (Eluère 1986; Oddy 1986) and some whetstones. Though a few touchstones are described as grey-green (Moore and Oddy 1985), none has been identified as chalcopyrite. There is to my knowledge no report in the literature of chalcopyrite used as an abrasive powder.

Discussion

This finding presents a warning to the field archaeologist when interpreting ore minerals discovered in finely-particulate form, and especially so when other evidence of grinding (as might occur in ore preparation) is present. The powder may not have resulted from preparing ore for smelting but instead be a part of a finishing operation.

In the study of ancient and traditional crafts, attention is naturally drawn first to the objects produced, and to the craftsman and his tools. Little if any attention is given the ancillary materials such as abrasives; in modern practice these are often termed “disposables.” If these accumulated over time a significant amount of material could have resulted. There is certainly a need for more identification of traditional craft materials comprehensive enough to include those consumed in production or afterwards discarded, as well as those that are preserved as part of the finished object.

There is also a need to identify the abrasive materials mentioned in documentary sources. For example, a Japanese document circa A.C. 700 on a hand scroll in the Shosoin Treasury mentions specific grit sizes needed to polish metal mirrors to be presented to the Great Buddha of Todai-ji (Nakano 1967). The abrasive materials mentioned include grit from limestone, soft charcoal, rough charcoal, blue whetstone, and iron powder resulting from blacksmithing (translation by Anne Yonemura, personal communication, 1991). This last abrasive is “iron scale,” or magnetite (Fe_3O_4). In the absence of such a document the presence of iron scale at a find location might be taken as an indicator of blacksmithing or even iron smelting rather than of polishing.

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