Analysis of Micaceous Clay Sources in the Northern Rio Grande

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INTRODUCTION

From 1998 to 2003 the authors conducted field surveys and geologic sampling in the Northern Rio Grande region of New Mexico. The purpose of the study was to investigate previously unreported sources of micaceous clay used in the production of indigenous ceramics. Micaceous pottery served as an important medium of exchange between Pueblo, Jicarilla Apache, and later Hispanic women from the fourteenth through the twentieth centuries.[1-5] This network has recently expanded to serve the modern art market and tourism industry. Archaeologists, however, have long been challenged by the general uniformity in appearance of mica pottery cross-culturally. Trace element characterization of source materials therefore is useful for examining multi-ethnic source utilization patterns.

The micaceous clays of the northern Río Grande occur in several Precambrian-cored topographic uplifts in the San Juan and Sangre de Cristo mountain ranges. The Precambrian complex is composed of metamorphic schists, quartzites and other meta-rhyolites and meta-sedementary rocks.[6] Muscovite is the most common mica type found in these formations, occurring in pegmatite dikes and in quartz-muscovite schists. The largest deposits are associated with the Vadito Group, a middle Precambrian rock sequence.[7,8] Geologists have divided the northern New Mexico Precambrian belt into ten pegmatite (mica-mining) districts.[9-11] Recent work by Post and Austin[12] demonstrates that mica deposits from eight of the districts can be distinguished based on trace element geochemistry of mica. Historic documents and ethnographic information further indicate that each of these areas was exploited by different pottery communities, which continue to be used today as clay sources.

DESCRIPTION OF ACTUAL WORK

Instrumental Neutron Activation Analysis (INAA) was performed at the University of Michigan, Phoenix Memorial Laboratory and at the Missouri University Research Reactor to chemically characterize duplicate geologic samples from clay tiles and ceramic sherds. Specimens were selected from 150 clay samples collected in the field. These were augmented by 23 raw clay samples and five ceramic vessel fragments from potter's workshops. We also submitted 510 archaeological specimens attributed to Pueblo, Hispanic, and Jicarilla Apache potters.

RESULTS

Bivariate plots, hierarchical cluster analysis, principle components, and canonical discriminant analysis (CDA) were used to explore trace element geochemical patterns.[13] Results of each of the statistical techniques produced consistent results. Several source districts, including Petaca, Picurís, and Cordova-Truchas can be distinguished based on trace element geochemistry. The Mora District was not adequately sampled for characterization. The Petaca district includes the Sunnyside and Red Mine source areas. The Picurís district is currently divided into five geochemical source areas including U.S. Hill, Camino Real, *Molo nan na*, Cieneguilla-Taos, and Cañada del Barro. The Cordova-Truchas District is represented by the Borrego Mesa source area. In general, trace element geochemistry is consistent with geographic distributions of Vadito Group clay deposits and spatial variability within these deposits. (Fig. 1)

Pottery artifacts were assigned to source based on CDA classification and visual examination of bivariate plots of functions one and two. In order to increase confidence in the results, two analyses were undertaken. The first classified sherds by source district, and the second classified sherds according to source area. Sherds that showed good agreement between source district and source area assignments were considered good matches. These matches were verified by examining bivariate plots of CDA functions. Clusters of sherds that fell outside density ellipses for established reference groups also revealed the presence of currently undefined source areas.

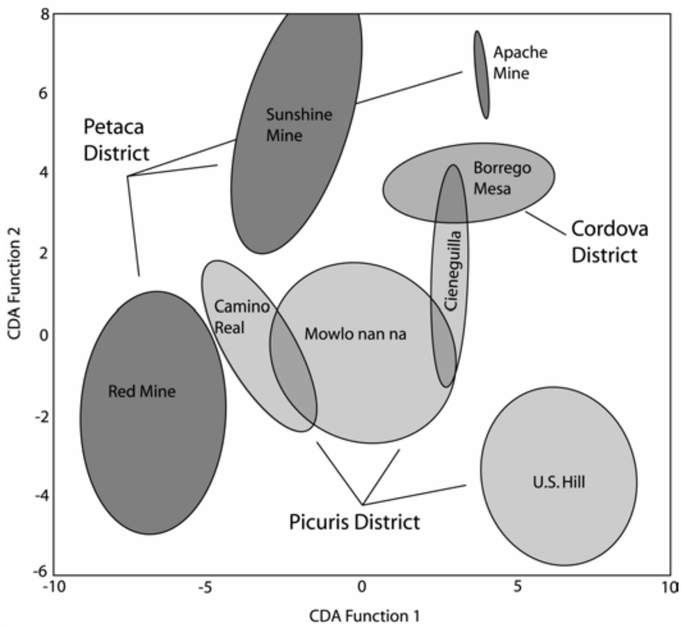

Fig. 1. Bivariate plot of CDA functions one and two showing separation of source areas.

INAA was highly successful in allocating ethnographic sherd and clay samples to source districts and areas with only four out of 28 misclassified. A total of 68 percent of the unknown archaeological samples displayed source matches at the level of source area, and 22 percent were assigned to undefined source areas within districts. This information, in turn, helps to refine ceramic type identifications and increase our understanding of interethnic exchange in the northern Rio Grande.

These findings also have important practical implications for contemporary pottery communities. As one example, INAA data were used recently to assist Picurís Pueblo in their legal case against the Oglebay Norton Mica Mine. Ceramic source matches and historic documents supported the Pueblo's contention that they maintained exclusive use rights over this source prior to the establishment of the mine in the early 1950s. In 2004, in part as the result of its lawsuit, Picurís regained ownership of the *Molo nan na* source area and in 2006 the Pueblo won an additional settlement for the removal of mica ore and the destruction of traditional clay pits.

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