View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by University of Missouri: MOspace

Public Abstract

First Name: Rachel
Middle Name: Sarah
Last Name: Popelka-Filcoff
Degree: Ph.D.
Department: Chemistry
Adviser's First Name: J. David
Adviser's Last Name: Robertson
Co-Adviser's First Name: Michael
Co-Adviser's Last Name: Glascock
Graduation Term: Fall
Graduation Year: 2006
Title: Applications of Elemental Analysis for Archaeometric Studies: Analytical and Statistical Methods for Understanding Geochemical Trends in Ceramics, Ochre, and Obsidian

Elemental analysis is an important methodology for understanding artifacts, from ancient technologies to sourcing studies. Three areas are covered in this dissertation: elemental analysis of Caborn-Welborn ceramics, elemental analysis and geochemical characterization of ochres, and construction and implementation of a portable XRF (X-ray fluorescence spectrometry) instrument for artifact analysis.

Trace element analysis was conducted on ceramics from Mississippian Caborn-Welborn sites located in the lower Ohio River Valley, using both neutron activation analysis (NAA) and particle-induced X-ray emission (PIXE). By using principal components analysis and posterior discriminant analysis, it was possible to compositionally distinguish lower Ohio Valley ceramics from ceramic samples collected from archaeological sites located in the southeastern part of the United States. Ceramics classified as Caborn-Welborn, as well as central Mississippi Valley types and Oneota-like sherds recovered from Caborn-Welborn sites appear to have been locally produced from similar clays.

Ochre and iron oxide materials are ubiquitous on many archaeological sites, and are found in cave artwork, mortuary contexts, and other ceremonial milieu. To date, ochre pigments have not been well characterized by elemental methods. This project analyzes ochre from several sources using instrumental analysis techniques, including neutron activation analysis NAA and XRF. Elemental methods were investigated on carefully sampled ochre from Missouri, California, Oregon, Texas, Arizona, and Peru. Multivariate statistics of the data point to trends in the inter- and intra-source variability of ochre. These trends in chemistry lead to a better understanding of ancient ochre procurement and geochemistry.

The second part of the dissertation covers the set-up, calculations, geometry, testing, and calibration of a portable XRF system. This includes the design and system geometry, testing of bulk and thin film standards, beam collimators, detector collimators, filters, sample holders, and designs for several of types of artifacts. The system was transported to, and used successfully in southern Peru to characterize obsidian artifacts, and the results are presented.