

APPLICATIONS OF ELEMENTAL ANALYSIS FOR ARCHAEOLOGICAL STUDIES:
ANALYTICAL AND STATISTICAL METHODS FOR UNDERSTANDING
GEOCHEMICAL TRENDS IN CERAMICS, OCHRE AND OBSIDIAN

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ABSTRACT

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 instrument for artifact analysis.

The first study is analysis of ceramics from Caborn-Welborn (Ohio Valley) archaeological sites, using both instrumental neutron activation analysis (INAA) 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 in both extra-regional and local analyses.

The second study analyzes iron oxides (ochre) from several sources using instrumental trace analysis techniques, including INAA, and X-ray fluorescence spectrometry (XRF). Multivariate statistics of the data point to trends in the inter- and intra-source variability of ochre. Elemental results from Missouri, California, Oregon, Texas, Arizona, and Peru have been investigated. These trends in geochemistry lead to a better understanding of ancient ochre procurement.

The third study covers the set-up, design and system geometry calculations, testing, and calibration of a portable XRF system. The system was transported to and used successfully in southern Peru in August 2005 to characterize obsidian artifacts.