X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN OBJECTS FROM CATAMARCA, ARGENTINA

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The concentrations of five trace elements (Rb, Zr, Sr, Ti and Mn) and one major (Fe) element have been determined in groups of obsidian samples by wavelength dispersive X-ray fluorescence spectrometry. Two methods were used for different elements on the basis of different excitation conditions and sample preparation procedures. Synthetic standards with compositions similar to those of the igneous stone were prepared into which the analytes were incorporated in solution. The method was used to establish the provenance of a number of prehistoric obsidian artifacts. The results ascertained in these analyses are discussed in this paper.

INTRODUCTION

Obsidian, a natural volcanic glass, was widely used in prehistoric times as raw material to manufacture lithic tools. Between 80 and 90% of the elemental com-
position of a typical obsidian specimen may be constituted by SiO\textsubscript{2} and Al\textsubscript{2}O\textsubscript{3}. However, it is the many trace and minor elements which have large inter-source variations that make chemical fingerprinting techniques successful\textsuperscript{1}. Thus, a good part of sourcing analysis is based on the "Provenience Postulate" which states that differences in chemical composition exist between different natural sources that exceed, in some recognizable way, the differences observed within a given source\textsuperscript{2}.

A number of instrumental measurement techniques have been utilized for determining minor and trace elemental contents in obsidian samples: optical spectrography\textsuperscript{3}, emission spectroscopy\textsuperscript{4}, neutron activation analysis\textsuperscript{5}, X-ray fluorescence spectroscopy\textsuperscript{6}, particle induced X-ray emission analysis\textsuperscript{7} and particle induced \(\gamma\)-ray emission analysis\textsuperscript{7}. Wavelength dispersive X-ray fluorescence is generally recognized as an accurate, rapid, sensitive and non-expensive technique for the determination of numerous trace and minor elements in stone specimens. In many studies, this method has been used successfully to attribute obsidian artifacts found in archaeological sites to their original source\textsuperscript{6,8,9}.

In general, lithic source analysis has contributed in archaeological research as a means of demonstrating contact between two geographic locations: the original source of a lithic object and the archaeological site from which it was ultimately recovered\textsuperscript{10}. In Argentina, there have been virtually no source-oriented geochemical studies on obsidian for archaeological research. Neither were there any attempts to correlate prehistoric artifacts to located or unlocated sources. Therefore, we have focused our work on the geochemical characterization of an obsidian deposit (Ona), located in the west margin