

Abstract Submitted  
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**Non-destructive X-ray Spectroscopy Methods for use in Study of Iron Age-Persian Period Arrowheads's** MITCHELL MILLER, CARLO SEGRE, ELIZABETH FRIEDMAN, Illinois Institute of Technology, JON ALMER, SARVJIT SHASTRI, Argonne National Laboratory, HEATHER SNOW, University of Toronto, LAURA D'ALESSANDRO, University of Chicago, LYNN SWARTZ DODD, University of Southern California — Non-destructive x-ray spectroscopy methods are commonly used to determine the composition and structure of unidentified samples. A novel application of these methods is to use a high energy (>80 keV) synchrotron source in the study of archeological artifacts thereby probing the bulk material instead of just the surface. Using x-ray fluorescence and diffraction, the raw materials and methods used in manufacturing arrowheads from several Iron Age-Persian Period Middle Eastern archaeological sites were investigated. The fluorescence spectrum provides information about the relative composition of the bulk while the 2D diffraction pattern can yield details about the composition of the majority bronze phase as well as highlight differences in thermo-mechanical techniques. The results obtained from analysis of the fluorescence spectra indicate that the arrowheads are bronze, composed primarily of a leaded copper – tin alloy. Additionally, after comparing the diffraction patterns to known standards, the percent weight of tin in the bronze alloys of select artifacts was determined. The addition of lead to copper-tin alloys, which would reduce the cost of the composite metal and improve the fluidity of the melt, may be more commonplace than previously thought. Data from both fluorescence and diffraction spectra will be presented.

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