



ARCHEM Project

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How to Collect Archaeological Objects for Organic Residue Analysis

The archaeometrical analysis of organic residues involves three major steps to produce data of a qualitative and quantitative nature: (1) Extraction; (2) Instrumentation; (3) Interpretation. Extraction produces a measurable amount of organic residues, which are then stored in 20mL scintillation vials and accessible for analysis in perpetuity. During extraction, fragments of objects are typically boiled in solvents and returned unharmed, if cleaner. Instrumentation involves the separation and characterization of the individual, organic compounds that compose each sample using analytical chemistry instruments. Finally, one must interpret this data in order to quantify and identify these compounds and hypothesize what substances an object contained in antiquity (e.g. wine, olive oil, perfumed oils, food, etc.) and what impact this might have in interpreting the surrounding space.

ARCHEM has collected thousands of samples from as early as the Neolithic Age to recent ethnographic samples from the last several centuries, with a special focus on the 2nd and 1st millennia BCE. The goal is to preserve and maintain a comprehensive collection of organic residues for subsequent chromatographic and spectrometric analysis at offsite chemistry facilities guided by specific archaeological research questions. Please contact Dr. Andrew Koh for further details about this step. Once GC-MS results are produced, they must be carefully interpreted to determine their significance for the research questions at hand.

WHICH OBJECTS ARE GOOD CANDIDATES FOR ORGANIC RESIDUE EXTRACTION?

In order to insure the collection of quantitatively and qualitatively significant samples, one must evaluate the level of preservation and potential contamination of each object. One of the primary concerns is that the objects be sampled before any cleaning or conservation. The longer one waits, the greater the chance for contamination and degradation.

Organic residues can be extracted from both complete and fragmentary objects. Fragments are optimally chosen from the base, rim, and body – in that specific order. Care must be taken to insure that multiple fragments originate from a single object. If unsure, choose only a single fragment from the base at a location where it joins the body.

Past work has indicated problems with objects exposed to the elements in the distant or recent past, though there is the potential for fat-soluble/non-polar compounds to survive imbedded in the fabric. Unless these objects are unique or particularly important, they are best passed up in favor of better-preserved examples. These exposed objects rarely provide a clear picture of their contents and the limited sample size they produce often complicates ongoing research and precludes the potential for reproducing and verifying results.

HANDLING OBJECTS FOR SAMPLING

Potential objects should be collected with clean, inert cloth, or gloves made of latex rubber, Teflon, or fabric, and subsequently wrapped in several layers of aluminum foil. Whole objects should be treated in a similar manner. If size is an issue, other options include new, inert bags that are not derived from plastics. The key is to avoid direct human contact and all plastics. Objects should be clearly labeled with contextual and other information relating to how it was found and isolated. Some forms of contamination include exposure to nicotine, suntan lotion, plastics, and a number of other common substances found at an excavation site. These forms of contamination can significantly obscure GC-MS results and subsequent interpretation. Objects suspected of coming into contact with any such contamination should be noted and avoided for organic residue analysis if at all possible in favor of better examples. References to relevant publications are always welcome.