Derivatization and Detection of FAMEs in Ancient North American Soapstone Artifacts
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Introduction

The presence of fatty acids in ancient pottery can yield important context clues. Since different fatty acids exist in plants and animals, their detection and identification adds information about a society’s dietary habits to include hunting, farming and animal domestication (Evershed et al., 2002). A three-step process is being used to identify fatty acids and background matrix in soapstone archeological artifacts retrieved from the Thrash site, a late Archaic period (8,000-3000 B.C.) site in Pike Country, Alabama. Soapstone is a term widely applied to rocks containing talc-MgSiO_3(OH); and other minerals the properties varying widely (Chidester et al., 1964). The detection of FAMEs (fatty acid methyl esters) can determine the presence of fatty acids left behind by organic matter in the artifacts. Once it is confirmed which fatty acids are in the artifacts, the fatty acids can be correlated to a range of plants and animals that came into an extended period of contact with the artifact.

Methods

Using a method developed by Spade and Russ, the derivation process converts the fatty acids to the FAMEs, making it easier to detect on the GC/MS chromatography/mass-spectroscopy), and identify which original fatty acids were in the artifact.

Figures

1. Fatty Acids with Acid Acceptors, Reaction and Product Process
2. The original soapstone bowl that was analyzed in comparison to the original soapstone bowl
3. The soapstone bowl that was analyzed in comparison to the original soapstone
4. Chromatogram of the FAME standards mixture

Results

A point should be made that the study is near done and has many more hours required before concrete results come in. So far what can be said is that the derivation of the fatty acids to fatty acid methyl esters (FAMEs) without the soapstone involved worked most likely to contamination of the GC/MS along with carryover from one soapstone sample into the next has led to unclear results. By the end of this semester the most likely source of the contamination and the carryover problem has been identified to the instruments’ sensitivity.

Conclusion

This study is still in the beginning stages, which reveals the reality of research that success takes time and rarely happens overnight. What has been discovered during this semester is that GC/MS can be a source of contamination and carryover. Since the issue has been dealt with, the next step of the experiment is to re-analyze the interior of the original soapstone from the quarry and compare it to a re-analysis of the interior of the first sample of the soapstone bowl. Then the remaining interior soapstone bowl samples will be analyzed. The exterior of the bowl samples will be derivatized as well to determine what originated from handling of the artifacts and what originated from the historic use of the bowl. Once the bowl samples are done, then samples from the interior of the soapstone pipes will be extracted and compared to the exterior of the pipes. For the bowl and pipe samples, to have a more accurate understanding of what is detected, standards will be made of the suspect items such as food for the bowl and plant material for the pipes. By the conclusion of the study, it will hopefully reveal what the eating habits were from 3,000 years ago, but the smoking habits of these from over a 1,000 years ago.

Works Cited

Craig, O.E., 1964. Determination of 

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