Mineralogical Characterization of Khirbat Edh-Dharih early Bronze Age pottery

Hussein Al-Sababha
The chair of the Department of Conservation and Management of Cultural Resources
Faculty of Archaeology and Anthropology
Yarmouk University
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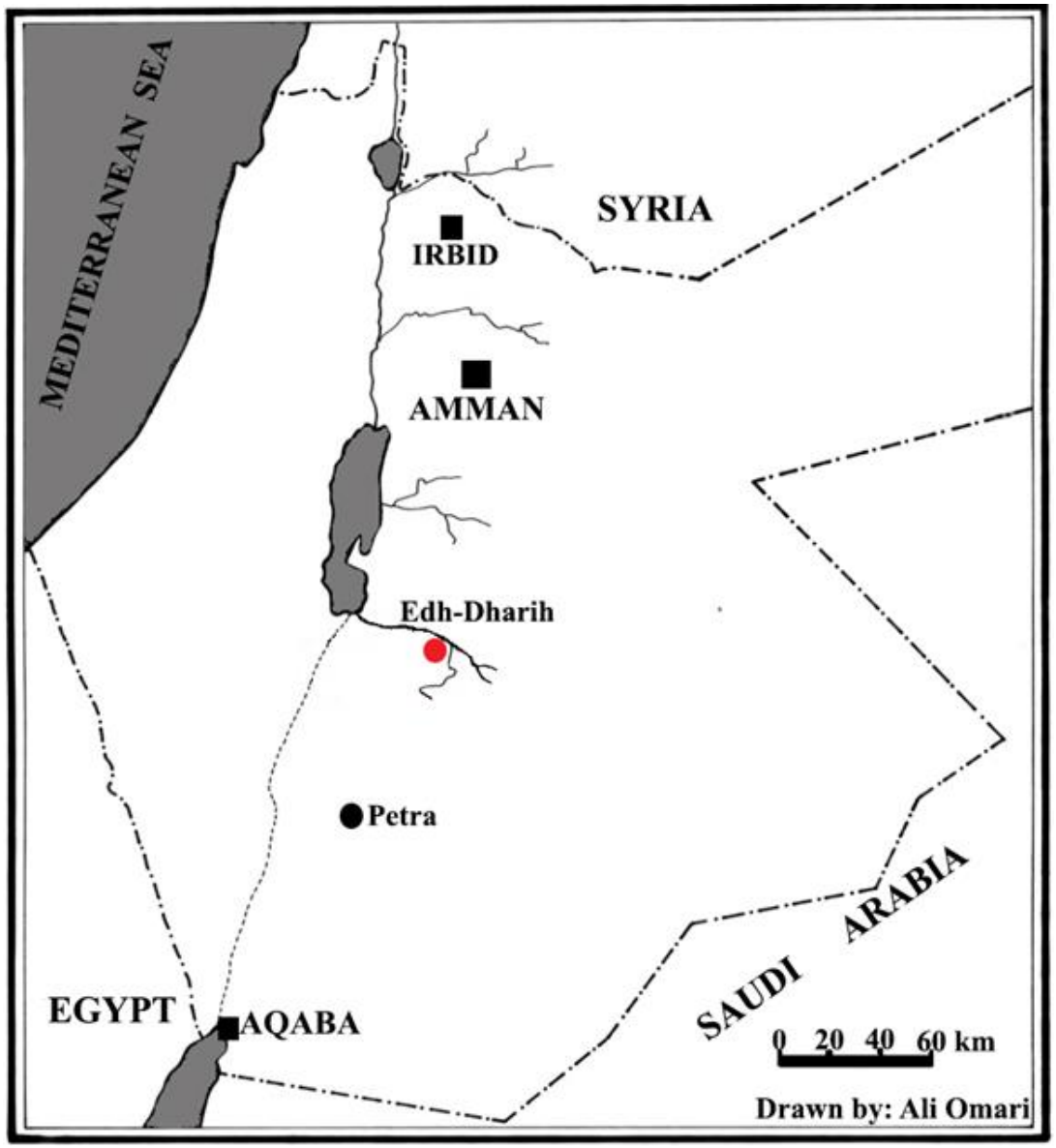
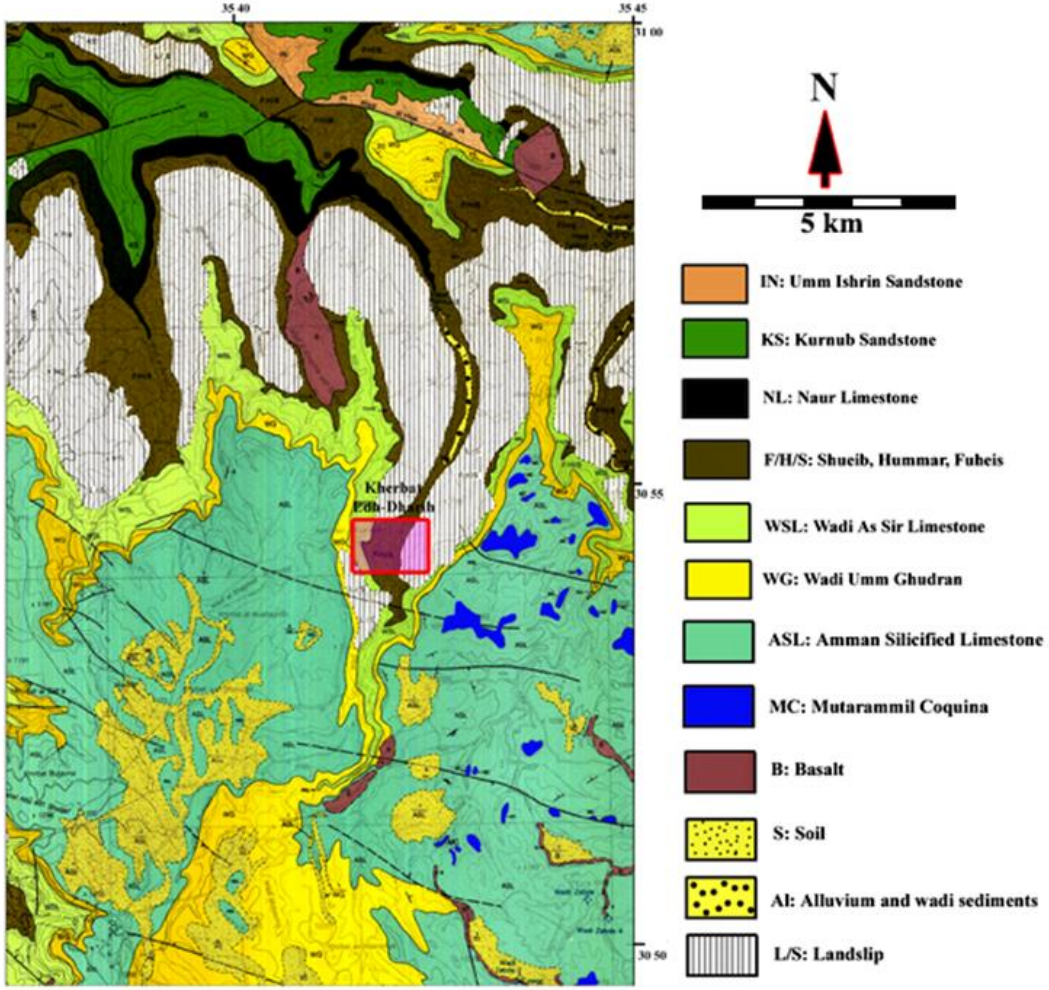
Location of the site:

The site of Khirbet Edh-Dharih is located on the southern bank of Wadi El-Hesa, on the border of Wadi al-La'ban, 70 km to the north of the Nabatean city of Petra and the city of Tafilah in southern Jordan.



Geology of the site:

The lithology of the Khirbet Edh-Dharih area shows that the outcropping rocks are mainly of sedimentary origin (from the Cambrian to the upper Cretaceous and Pleistocene Ages), such as fluvial clastic and marine sandstone, marine limestone, dolomite, marls, chalk, chert, bituminous marl, and phosphate. Furthermore, basalt flows from the Pliocene to Pleistocene epochs are exposed.



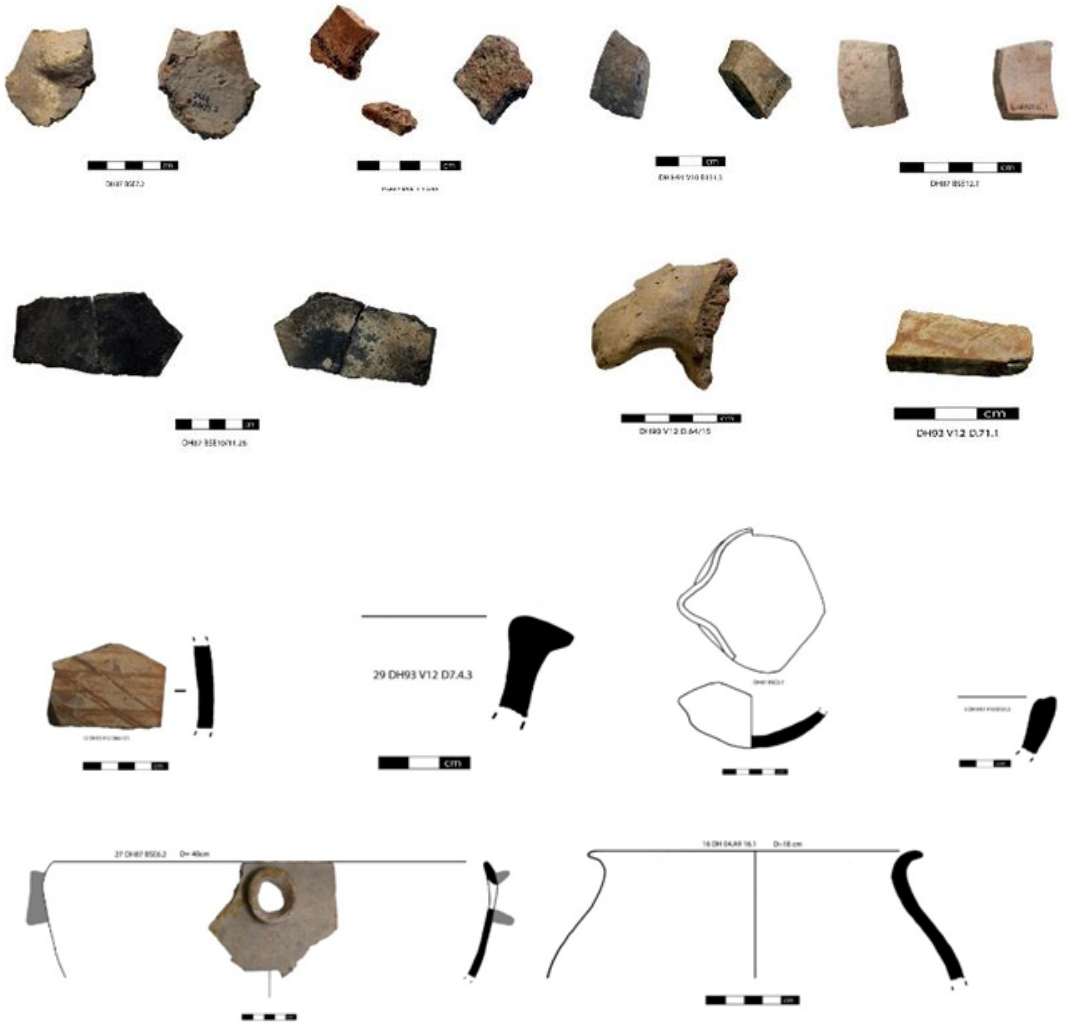
(Modified after Tarawneh, 1987).

The Bronze Age Pottery from Khirbet Edh-Dharih

- Excavations at the site recovered plenty of pottery sherds dated to the Bronze Ages.
- Previous archaeological studies of the bronze age pottery pointed out occupation of the site during the third millennium BC (Early Bronze II-III), also possibly through the second millennium BC (Middle and Late Bronze Age)

Archaeological Study of Pottery sherds:

Sample No.	Ware	Type	Color	Date
1	coarse	deep bowl rim (thickened rounded shape	2.5Y 4/1 dark gray	EB1
2	coarse	ledge handle of a holl-mouth jar, poorly levigated	7.5YR 7/3 pink	EB1
3	coarse	loop handle of a storage jar poorly levigated	7.5YR 7/4 pink	EB1
4	coarse	body sherd	5YR 5/1 gray reddish brown	EB1
5	coarse	body sherd of a jar	7.5YR 5/1 gray	EB1
6	coarse	inverted thickened rim of a krater or bowl	7.5YR 5/1 gray	EB1
7	fine	body sherd	7.5YR 4/4 brown	EB1
8	fine	thickened rim of a bowl	5YR 6/4 light reddish brown	EB1
9	coarse	body sherd of a small jar	7.5YR 7/6 reddish yellow	EB1

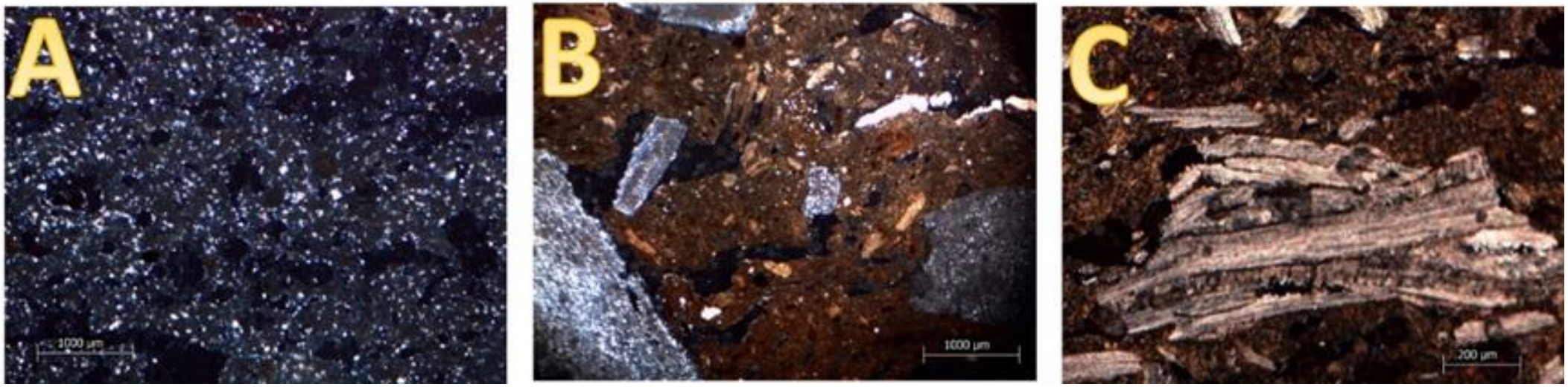


Petrography and XRD

- Both techniques supplement each other in determining the mineralogical constituents of the samples.
- Each sample was sliced to two slices one for the Petrography (thin-section) analysis, while the second for powder XRD analysis.
- Petrography has several advantages over the other mineralogical methods

- (it is a cheap, reliable technique, specific individual fabrics, suggest provenance, technical aspects, which portray the ware and any diagnostics of particular fabric groups, grain size, whether fine or coarse; grain shape, rounded or sub-rounded; or angular or sub-angular, estimating the firing conditions and temperatures and identification of the potter's technical skills).
- X-ray diffraction analysis advantage in pottery study is in the examination of the impact of heat on minerals present in pottery
- XRD grant data concerning the mechanical and thermal treatments the artifacts were subjected to during the manufacturing processes.

Petrography data:



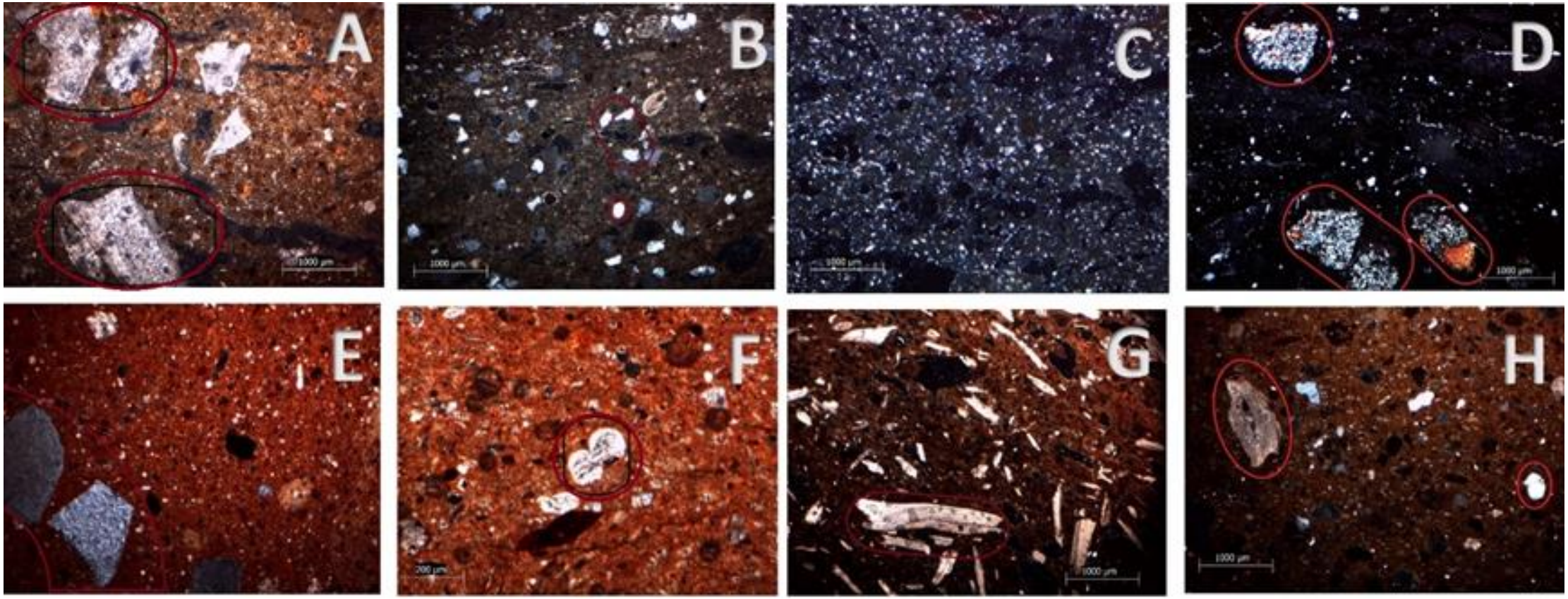
Photomicrographs of the three groups:

A. fine matrix group.

B. coarse matrix group.

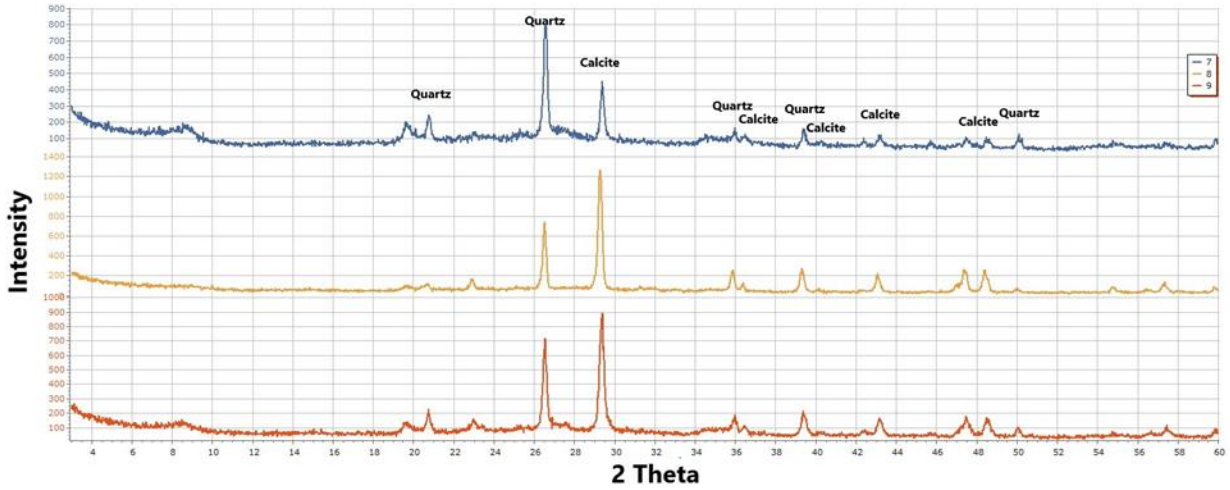
C. mixed matrix group that contains organic matters (Chaff).

All the micrographs were taken under cross polarized light (CPL).

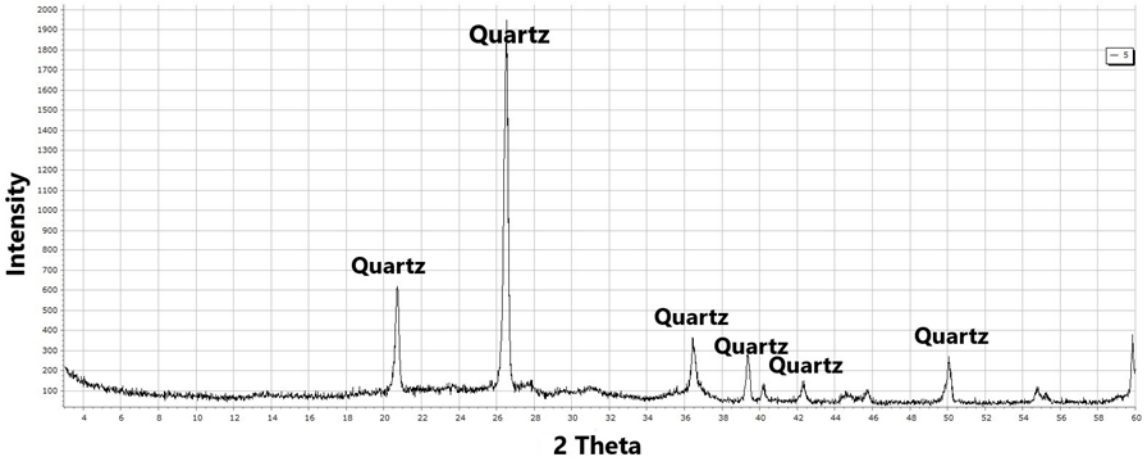


6 Photomicrographs of different non-plastic materials:

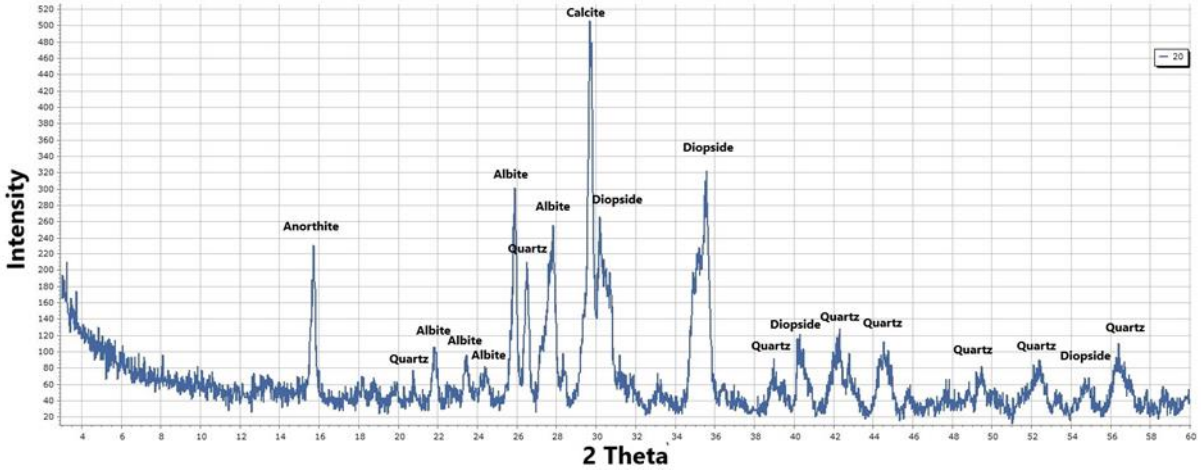
A. Micrite limestone
B. coarse quartz
C. fine Quartz
D. Basalt
E. Chert (flint).
F. foraminifera fossil
G. Chaff
H. Micrite with quartz.



Diffractographs of the first group samples



Diffractograph of sample 5



Diffractograph of sample 20, group 2.

According to XRD results, the pottery assemblage can be divided into two groups. Group 1 (23) samples contain just two phases quartz and calcite, except for sample 5 that did not have any calcite. Group 2 consists of (5) samples all contain quartz, calcite, and newly formed phases diopside, anorthite, and gehlenite

Conclusion:

- The assembly of the entire pottery samples points out that there is little divergence in any of the samples.
- The changes are due to the amount and nature of the tempering materials, different forms means different tempers.
- Both petrography and XRD analysis proved that the frequently utilized clay materials for the production of the pottery matrices were calcareous illite clays.
- Therefore it is believed that all samples were locally made because their constituents reflect the local geology of the surrounding area of the site.

Thank you all for your patience