

# Rocks and bricks from the Akko Tower Wreck, Israel: Archaeological and petrographic study

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The Akko Tower Wreck is the remains of a 25-m-long merchant brig, dated to the first half of the 19th century, and built under the influence of the French shipbuilding tradition. The shipwreck was excavated during four seasons in 2012, 2013, 2015 and 2016. The ship's remains were covered with a pile of dark slate with white calcite veins 6.5 m wide, 10.5 m long, and 1 m high, ranging from pieces 70×25×10 cm down to gravel. Rocks and bricks were documented in situ (Fig. 1), and studied further at the University of Haifa.

## Rocks

Petrographic microscopy (Fig. 2), XRD, and SEM-EDS analyses of rock samples showed the presence of calcite, quartz and clay minerals (Illite group and Kaolinite-Clinoclore group) in all rock samples, and dolomite in about half of them. The results confirm the homogeneity of the rock assemblage, which was not of local, eastern Mediterranean, origin. Since ballast in merchantman may have been replaced between voyages, the analysis of the rocks may not necessarily indicate the ship's home port.



Fig. 1. (a) Rocks covering the shipwreck remains; (b) Dark slate with calcite vein. Photos: A. Yurman



Fig. 2. Thin section of a rock, showing calcite vein and layers of clay minerals. Photo: H. Kravits, by 3D digital (HIROX RH-2000) microscope

## Bricks

An assemblage of 35 bricks and brick fragments with no manufacturers' stamps was also found. Petrographic microscopy and XRD analyses on 16 brick samples indicated heterogeneity in ceramic properties and chemical composition. Digital microscopy under plain polarized light for thin section analysis of bricks revealed voids distribution and inclusion properties. XRD analyses revealed presence of clay minerals in seven bricks: Muscovite (four bricks), Analcime (three bricks), Lizardite (one brick). Prof. H. Mommsen of the University of Bonn conducted INAA analysis. Six bricks were chemical loners, one of which was probably from Euboea. Ten brick samples were classified into two groups with similar chemical compositions: one group comprises four yellow burnt bricks of similar dimensions from an unknown region (not local); and the other six red burnt bricks of different sizes, whose possible origin is southern France.

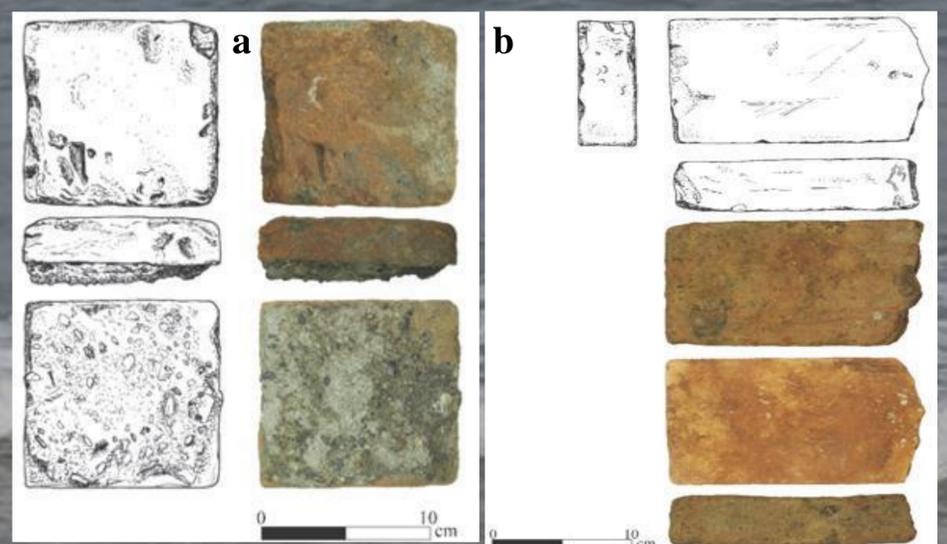


Fig. 3. (a) Reddish-yellow brick with cementation material; and (b) pink brick. Photos: A. Bar, drawings: R. Pollak

## Conclusions

- The estimated total weight of the rocks was about 60 tons, which would have been an adequate ballast weight for a brig of the suggested dimensions.
- The brick assemblage is heterogeneous. They could have been used as part of a stove in the ship's galley.

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