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Metallurgical characterization of brass objects from the Akko 1 shipwreck, Israel

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ARTICLE DATA

Article history:
Received 16 November 2013
Received in revised form
17 February 2014
Accepted 18 February 2014
Available online 26 February 2014

Keywords:
Akko 1 shipwreck
Brass artefacts
Drawing process
Microstructural characterization
Rolling process
Tin–lead solder

ABSTRACT

The Akko 1 shipwreck was a small Egyptian armed vessel or auxiliary naval brig built in the eastern Mediterranean at the beginning of the 19th century. During the underwater excavations, about 230 brass hook-and-eye closures were found, mainly in the bow area. In addition, 158 brass cases were found, mainly between midships and the aft extremity of the shipwreck. Metallurgical non-destructive and destructive characterizations of selected items were performed, including radiographic testing, XRF, lead isotope analysis, optical microscopy, SEM–EDS and microhardness tests. The hook-and-eye closures and the cases were both found to be made of binary copper–zinc alloy (about 30 wt.% zinc). While the brass cases were made from rolled sheets, hand-made using simple tools, and joined by tin–lead soldering material, the brass hook-and-eye closures were hand-made from drawn brass wire, and manufactured from commercial drawn brass bars by a cold-working process. The lead isotope analyses suggest different provenances of the raw materials used for making the brass objects, thus the different origins of the ores may hint that the brass wire and sheet were imported to the workshops in which the objects were manufactured.

1. Introduction

1.1. Historical Setting

The historic walled port city of Akko (Acre, St. Jean d'Acre, Akka) lies at the northern extremity of Haifa Bay, in the north of Israel (Fig. 1). It has a continuous settlement history from the Early Bronze Age to the modern era, serving as an important port [1–3].

The town and harbour were conquered by the Ottomans in 1516 [3, p. 9], and during the Late Ottoman period were the scene of several naval campaigns. In 1799, British control of the sea and the harbour of Akko prevented Napoleon Bonaparte from taking the town, and stopped his advance northwards [4, p. 28; 5, pp. 372–373]. Muhammad Ali's Egyptian flotilla bombarded Akko heavily in December 1831. The defenders of Akko withstood the attack from the sea, and the Egyptian ships were severely damaged. The Egyptians took the town by land on 27 May 1832, after a 6-month siege. The period of Egyptian rule over Akko lasted until 3 November 1840, when a British–Austrian–Ottoman fleet bombarded the town. During this attack, the main powder magazine of Akko exploded,

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http://dx.doi.org/10.1016/j.matchar.2014.02.012
1044-5803/

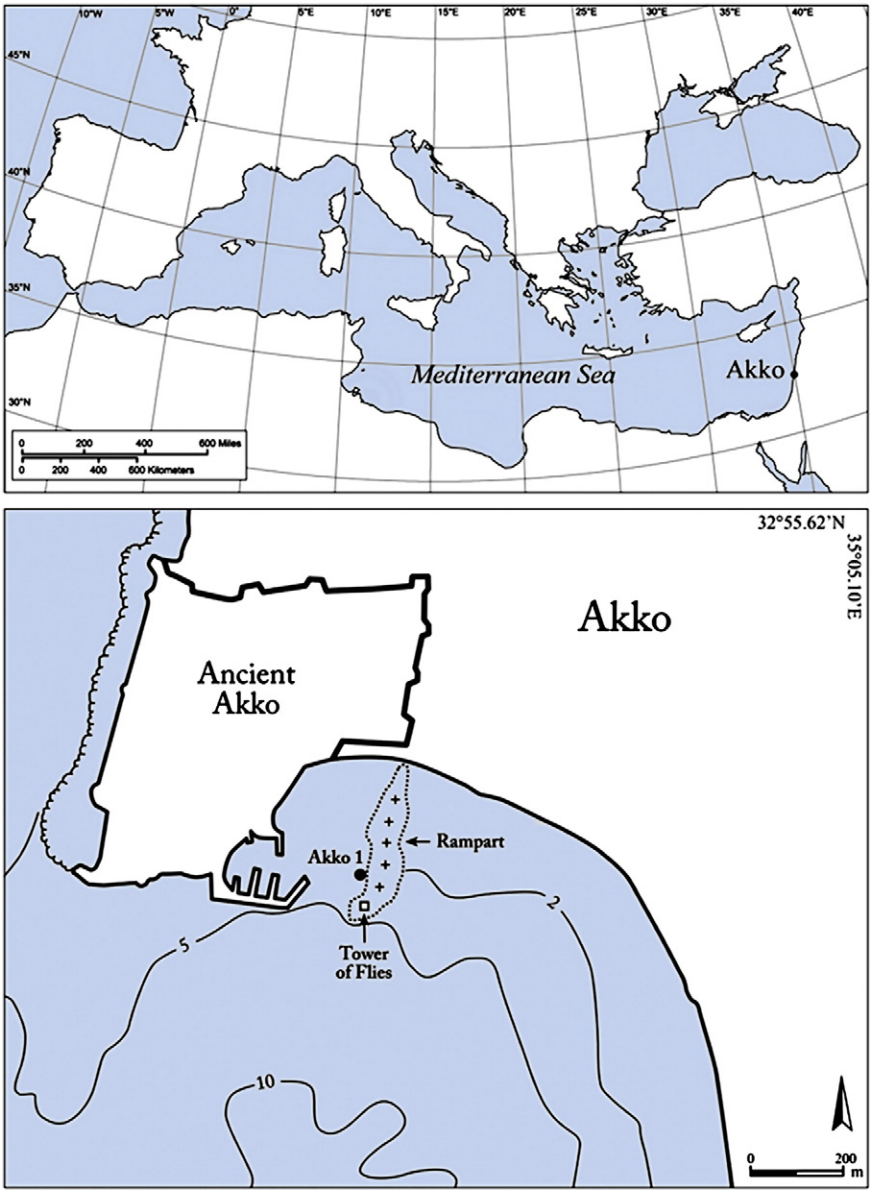

Fig. 1 – Location of Akko and the Akko 1 shipwreck site (drawing: S. Haad and N. Yoselevich).

causing enormous damage to the town, which was taken the following day [4, pp. 39–48; 5, pp. 561–564]. The Akko 1 shipwreck is apparently a result of the 1840 campaign [6, p. 184; 7, p. 2527; 8, pp. 779–781].

1.2. *The Akko 1 Shipwreck*

The Akko 1 shipwreck was found in 4 m of water inside the ancient harbour of Akko. It was excavated over three seasons from 2006 to 2008 by the Leon Recanati Institute for Maritime Studies of the University of Haifa. The shipwreck remains, lying north-west to south-east, were 23 m long from the bow to the aft extremity, and maximum 4.66 m wide from the line of the false keel to the uppermost remains of the port side. Two considerable sections of the hull survived: a section of the port side close to the stern, and the lower part of the forward port side. Among the hull component remains were sections of the keel and false keel, bow timbers, hull planks, framing timbers, and ceiling planks, most of which were made from eastern Mediterranean hardwoods. It is suggested that the ship was a small Egyptian armed vessel, or auxiliary naval brig, about 26 m long, built in the eastern Mediterranean at the beginning of the 19th century [6].

1.3. *The Brass Objects*

During the excavations a variety of artefacts was found in the shipwreck, and this paper deals with two types of brass objects — hook-and-eye closures (Fig. 2) and cases (Figs. 3 and 4), as part of an ongoing series of studies of the shipwreck and its finds [e.g., 6–9]. Although the brass cases have previously been studied [9], this paper describes more detailed metallurgical