



An early Iron Age assemblage of faience beads from Ashkelon, Israel: chemical composition and manufacturing process



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ABSTRACT

The microstructure and chemical composition of eight faience beads from an early Iron Age (12th century BCE) assemblage found in the ancient city port of Ashkelon (Israel) are determined by means of FTIR spectrometry, pXRF, microRaman and SEM-EDS analysis. The results are compared with published data of Egyptian and Near Eastern artifacts. Each sample exhibits a hue which is obtained by adding a specific colorant to the glazing mixture. A new gray chalcopyrite-manganese-based colorant was identified. Cementation glazing was most likely used in the manufacturing process of the specimens analyzed, except for the blue bead, which is an Egyptian blue frit. The results suggest that these objects represent a unique assemblage, quite different from contemporary Egyptian and Near Eastern materials, and provide new information regarding the Iron Age faience evidence in the southern Levant.

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1. Introduction

Faience beads are a common find in Bronze and Iron Age archaeological contexts in the Levant (Sass, 2000; Ben-Shlomo, 2006; Sass and Cinamon, 2006; Gera, 2007; Park, 2011). Despite the wealth of material recovered in excavations in this region, few studies focusing on the characterization at the microscopic scale of faience artifacts have been published (McGovern, 1990; McGovern et al., 1993; Matoian and Bouquillon, 2000; Groot et al., 2006; Caubet, 2007; Tite and Shortland, 2008). Faience usually consists of a ground quartz core coated with a glaze obtained by mixing an

alkali flux, lime, and colorants, although some variants in this technology are known (Lucas and Harris, 1962; Tite and Shortland, 2008: 55). Its first appearance dates to the 4th millennium BCE, both in Egypt and Mesopotamia (Tite et al., 2007). This material was used to produce vessels, tiles, figurines and jewelry objects such as amulets, scarabs, pendants, rings and beads.

Previous studies have been dedicated almost entirely to the characterization of faience objects found in Egypt, from the Predynastic through to the Roman period. Lucas and Harris (1962) reported the first detailed classification of faience objects based on macroscopic observations and also prepared experimental samples by glazing quartz pebbles with a mixture of natron and malachite. The glaze was subsequently removed from the pebbles, powdered, and then applied on a quartz body and fired again. This is called the application method. The ethnoarchaeological work of Wulff et al. (1968) highlighted another viable option to produce faience, based on the observations made in a traditional workshop located in Qom, Iran. The quartz core was embedded within the

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glazing mixture (in this case made of copper oxide, hydrated lime, plant ash, quartz powder and charcoal) and then fired. After firing the remains of the glazing mixture were easily detached from the object, which as a result was covered with a thin glaze – hence the name of cementation glazing method. Noble (1969), working on previous results by Binns et al. (1932), prepared experimental samples of faience by mixing quartz powder with natron, copper oxide, bentonite, whiting and water. This paste was then molded into the desired shape and the object left to dry at room temperature. The drying process facilitates the precipitation of soluble alkali salts on the surface of the object through capillary action. This thin layer turns into a glaze when fired to ~950 °C. This efflorescence glazing method was also characterized by thin section petrography of experimental samples compared to archaeological materials. However, only with the works of Vandiver (1983), Kaczmarczyk and Hedges (1983), Tite et al. (1983), Tite and Bimson (1986) and Vandiver (1998), which employed SEM-EDS and electron microprobe analyses on ancient Egyptian artifacts and laboratory replications, was it possible to investigate the microstructure and raw materials of the specimens at the microscopic scale level. These analytical techniques allowed a detailed study of the glazing methods mentioned above. Recently, this approach has been applied to Bronze Age and Iron Age faience artifacts found in other regions of the Mediterranean, such as Italy and Greece (Artioli et al., 2008; Tite et al., 2009).

The primary aim of this study is to characterize the mineralogical composition of all the colors of an assemblage of 5697 beads recovered in the site of Ashkelon, located on the southern coast of Israel (Fig. 1). In a first attempt, we used Fourier Transform infrared spectrometry (FTIR) and portable X-ray fluorescence (pXRF) to get insights into the composition of the colorants used, since these techniques are currently available in Ashkelon in an on-site laboratory. The facility was established in order to obtain real time information on the contexts under excavation and to integrate the macroscopic and microscopic archaeological records (Weiner, 2010). This served as a first screening step for different artifacts. However, the results thus obtained proved to be limited and raised new questions about the microstructure and manufacturing process of the beads, which required a more detailed approach. For this reason, SEM-EDS analysis and Raman microspectrometry were carried out in the laboratory after the end of the excavation. The second purpose of this study is to compare the results presented here with previous studies, in order to get insights into the manufacturing process, especially the glazing methods employed in the production of the beads, and to add new information to the current dataset of Iron Age faience beads in the southern Levant.

1.1. The site of Ashkelon and the archaeological context

The ancient city of Ashkelon has been investigated by the Leon Levy Expedition to Ashkelon under the direction of Lawrence E. Stager (1985–present) and Daniel M. Master (2007–present). The site became an important port in the Early Bronze Age and grew to a city of 60 ha during the Middle Bronze Age. The city was occupied until the 13th century CE, when it was destroyed by the Mamluks (Stager et al., 2008).

At the end of the 13th century BCE, the Merneptah stele and a Karnak relief both describe the conquest of the fortified, Canaanite city of Ashkelon (Stager, 1985; Hasel, 1998: 80, 181), but the Egyptian conquest was merely a prelude to the following events. At some point in the 12th century, an entirely new architectural plan was imposed on the landscape at Ashkelon including several free-standing structures organized around an open exterior courtyard (Aja, 2009: 233–234). The cultural changes evidenced in these new structures are complex, but the excavators argue that the primary



Fig. 1. Map showing the location of Ashkelon and other major Iron Age sites in southern Levant.

cause was the immigration of a foreign “Sea-Peoples” population in the early 12th century who established a southern Levantine beachhead during the last days of the Egyptian domination of Canaan (Mazar, 1985; Stager, 1985; Master and Aja, 2011).

Building 572 consists of at least five rooms and contains evidence of habitation spanning two architectural sub-phases of the earliest Iron Age at Ashkelon, labeled Grid 38 Phase 20b and 20a (Fig. 2; Stager et al., 2008: 257–8). The building follows typical, Iron I house patterns which are repeated at the “Sea-Peoples” cities of Ashkelon, Ekron, and Ashdod (all of them located in modern Israel), but remain decidedly different from those of the local Canaanite and Israelite structures of the Late Bronze and Early Iron Age. Though the Building 572 is domestic, it is larger and more complex than the many dwellings and contains a plaster-covered four-horned altar in Room 572.

Within Building 572, Room 587 had two distinct floors corresponding to sub-phases 20b and 20a. Based on recovered Aegean-style ceramics (Master and Aja, 2011: Fig. 4.1–9), Phase 20b is contemporary with the Mycenaean IIIC Early 1 to Early 2 transition (ca. 1170 BCE), while Phase 20a corresponds to the Mycenaean IIIC Early 2 to Middle transition (ca. 1150 BCE). The earlier (Phase 20b)

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