THE GLASS BEAKERS OF NESIKHONS: A PRELIMINARY REPORT

BIRGIT SCHLICK-NOLTE and RAINER WERTHMANN

The first known glass vessels were crafted in Western Asia and in Egypt in the 15th century BC. They were formed around a core, and they are either inscribed with the names of kings or come from dated sites.¹

In Egypt, the technique of core forming was employed during the second half of the 2nd millennium BC. The last known vessels from an Egyptian context belonged to Nesikhons, wife of the high priest Pinudjem II, supreme chief of the harem ladies of the god Amun, and superior chief of the whole female priestly personnel of almost the whole of Upper Egypt during the 21st Dynasty in the early 10th century BC.² She was buried with rich goods, including more than twelve glass beakers (Figs. 1 and 2),³ in cliff tomb no. TT 320. It is situated on the western banks of ancient Thebes (modern Luxor) in the Nile Valley.⁴ This tomb was used for the priestly families in the 11th and 10th centuries BC. In years of turmoil, it also served as a cache for royal mummies, including Ramesses the Great. According to an inscription at the entrance, Nesikhons was placed in the tomb on April 9, 974 BC,⁵ which has to be considered the terminus ante quem for the fashioning of the glass beakers.

While glass vessels in a variety of shapes are known from ancient Egypt, beakers were only rarely made of glass. The shape of the beakers from the tomb of Nesikhons is rather crude (Figs. 3 and 4), and many of them are made of yellow or green glass (Fig. 3). Two yellow beakers are adorned with a green rim (Fig. 4). One preserved beaker and a number of fragments indicate that more than three of these

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The observed colours are blue, green, yellow, black, and white. For colouring agents, we found copper oxide dissolved in the glass, and various antimonites as insoluble pigments. In the black-brown glass, which is translucent in thin splinters, no pigments and no unusual amount of heavy metals for colouring were found, along with a little iron and sulphur. Therefore, we assume that the dark brown colour is what is known in today's glass industry as 'coal yellow', the colour of medicine flasks. It is produced under reducing conditions, and one colouring agent was reported to be iron sulphide.

We detected no remains of unmelted raw materials, even though there is a certain variability in composition even in the millimetre range. In all pigmented samples, a Schlieren structure is visible, indicating that the glass must have been stretched in a viscous state.

As regards corrosion, mainly sodium has been leached out, so that all the other elements have been accumulated. In some instances, the surface is covered by longish crystals containing considerable sodium (Fig. 4). We are certain that this is trona Na₂H₃(CO₃)₂·2H₂O. Its occurrence, as well as the way the crystals adhere to the surface, can easily be explained when assuming corrosion by humidity. The growth of these crystals even in minute fissures must have cracked the glass.

To better understand differences in the glass and techniques used in the making of New Kingdom vessels and the vessels found in the tomb of Nesikhons, chemical analyses were performed, using a scanning electron microscope (SEM) with integrated electron microprobe. In addition to observing the original surface, we embedded the samples in synthetic resin, then cut and polished them. In this way, we were able to distinguish between unaltered glass and corroded areas.

On each of the samples, surface corrosion is clearly visible (Figs. 5 and 6). The glass and the corrosion layer were analysed separately. Some of the samples contain insoluble pigments in the form of particles that are visible when operating the SEM in the back-scattered electron mode. Figures 5 and 6 show SEM pictures of yellow and green glasses at magnifications of 498X and 1500X, respectively. In both cases, the Schlieren structure of the pigments can be seen. The sample shown in Figure 6 reveals a broad layer of corrosion along the original surface and a narrower one along a crack inside the glass.

The glass is relatively rich in sodium and poor in calcium. The calcium level is much less than that of ordinary soda-lime glass. The glass also has very low levels of potassium and magnesium oxide. In accordance with Lilyquist and Brill, we conclude that it was made with soda.
Fig. 6 SEM picture of glass from green beaker (Fig. 3) at magnification of 1500X; photo courtesy of K+S AG, Kassel

taken from vertical and other indentations that are found on the beakers. After firing and annealing, the gypsum mould could easily have been removed from the beaker. Faint traces of white gypsum on the interior walls, as can be seen on the ancient beakers, could have been removed by water or by rubbing.

Additional chemical analyses are ongoing. Experiments employing materials, tools, and conditions resembling those of antiquity are planned, and the results will be published in detail. At the University of Kassel in Germany, similar tests on copper melting to investigate the forming of ancient glazes (the first glass) have already produced some striking results.10

ENDNOTES

1 Poul Fossing, Glass Vessels before Glass-Blowing, Copenhagen: Ejnar Munksgaard, 1940; Birgit Nolte, Die Glasgefäß im alten Ägypten, Münchener Ägyptologische Studien, 14, 1968; idem, ed.


3 Nolte, Die Glasgefäß, 1968 [note 1], 76–7, pls. XXI, 12, 13, and XXVII, 4, 44, and 57; idem, Die Glasgefäß, 1985 [note 1], 61, fig. 5–12, 62, fig. 5–13, and 116, figs. 52, 54, and 57.


5 The Egyptian date was kindly converted to our calendar by Prof. Dr Jürgen von Beckerath.


7 Erhart Graefe, ‘Vorbericht über die erste Kampagne einer Nachuntersuchung der königlichen Cachette TT320 von Deir el Bahri’, Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo, 56, 2000, 219. Prof. Dr Graefe kindly provided us with a new isometric map of the tomb and a colour photograph of the vessel fragment so that we could present them at the 15th AIIHV congress.

8 See, for example, Nicholas Reeves and Richard H. Wilkinson, The Complete Valley of the Kings: Tombs and Treasures of Egypt’s Greatest Pharaohs, London: Thames and Hudson Ltd., 1996, 197, where three beakers of Nesikhons are depicted.

9 We thank Rosemarie Lierke for her many experiments to help determine the technique used in manufacturing the beakers. They were described in detail in her poster, ‘Archaeological Glass Experiments: No Simple Matter’, which was presented at the 15th AIIHV congress.


BIRGIT SCHLICK-NOLTE
Liebieghaus-Museum of Ancient Sculpture, Oberer Reissberg
11, 61350 Bad Homburg, Germany
E-mail: birgit.schlick@t-online.de.

RAINER WERTHMANN
Immenhäuser Strasse 16, 34128 Kassel, Germany
E-mail: rainer.werthmann@k-plus-s.com