Calcite bead manufacture and use at Mapungubwe

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Introduction

Un-worked and semi-worked pieces of calcite crystal as well as four complete beads were collected at Mapungubwe during the 2003 (or Phase III) Mapungubwe Stabilization Project (Nienaber and Hutten, 2006). Calcite beads and objects from Mapungubwe have not been described previously.

Calcite is a soft stone therefore making it easy to manipulate into a variety of shapes. A possible method for the manufacture of beads is proposed, supported by microscopic evidence, which also suggests that the complete beads were strung and worn.

The Geology of calcite crystal

Calcite ($CaCO_3$) is an exceptionally common and important biogenic and inorganic constituent of modern marine sediments and Pleistocene rock (Tribble et al, 1995), making up 4% of the weight of the Earth's crust. It is also a very widely distributed mineral throughout the world and is commonly found in caves, ore deposits, dolerites and vug and vein fillings in lava (Cairncross and Dixon, 1995). Calcite crystals can vary in form including, rhombohedrons, scalahedrons, prisms and pinacoids and vary in colour (white, light shades of yellow, orange, blue, pink).

Calcite is relatively soft with a hardness of less than 2.5 on the Mohs scale (1 10) and can be scratched with a fingernail (http://mineral.galleries.com).

White to colourless calcite crystals have been associated with the copper mines in the Messina area (Cairncross and Dixon, 1995) which is in close proximity to the Mapungubwe area.

Description of finds

The calcite objects from Mapungubwe Hill (77 pieces in total) vary in size, colour and quality suggesting probable different places of origin. It seems certain that calcite was collected in the form of crystals or aggregates of crystals and imported to Mapungubwe - they could not occur naturally on the hill itself. There aggregate was broken up and pieces selected for jewellery manufacturing. Some of these were rounded and smoothed in a symmetrical fashion and a hole was drilled for use as a decorative bead. Others pieces were rounded but kept long it is suggested that these pieces are not part of the bead manufacturing process, but rather were prepared for a different ornamental use.

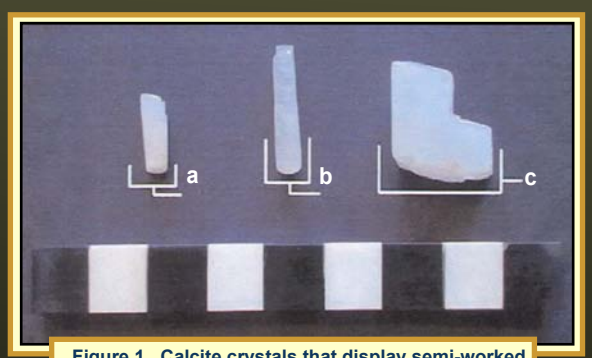

Figure 1. Calcite crystals that display semi-worked areas with a), b) and c) indicating those areas

Figure 2. Calcite crystals that have been completely worked on and have been smoothed to a specific shape

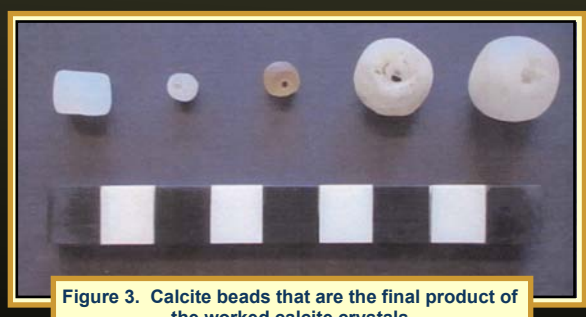

Figure 3. Calcite beads that are the final product of the worked calcite crystals

Bead analysis and proposed method of manufacture

The microscopic analysis of the surfaces and edges of stone artefacts can provide valid and instructive insights for the study of their use (Odell & Odell-Vereecken 1980, Lombard 2003, 2005), or as illustrated here, for their manufacture.

Three beads and one point from Mapungubwe were analyzed using a binocular microscope with external cold light sources and a fitted digital camera. Magnifications of between 6 and 60 times were used. The microscope has an even transition between exposures, so that the exact exposure for each image cannot be established.

Shaping of the bead blanks

Based on the available material it is proposed that blanks were shaped by rubbing calcite crystal fragments with uni-directional motions against a hard, flat, abrasive surface (Figure 4). Thus, many raw materials could have been used as abrasion surfaces. However, the spacing and texture of the striations (Figure 4) may indicate a medium-grained stone with well-sorted, sharply angular grains such as sandstone, which is also main geological feature of the Mapungubwe region. Abrading the calcite crystal blanks against such a surface created small, flat facets around the circumference of the bead providing it with its basic shape and size (Figure 5).

Figure 4. Striation marks created from movement in a uni-directional motion.

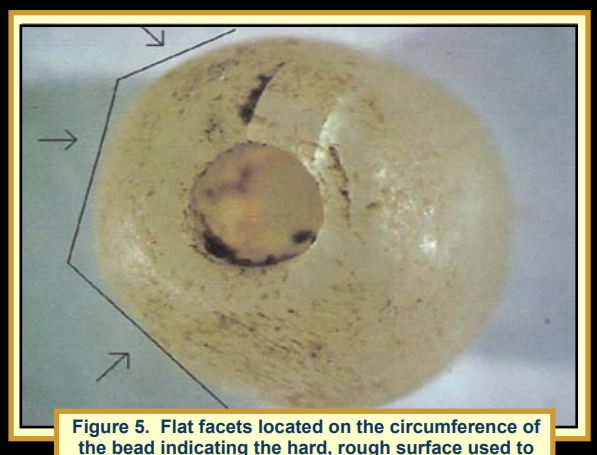

Figure 5. Flat facets located on the circumference of the bead indicating the hard, rough surface used to shape these beads

Initiating and making the holes in the beads

Observation of the calcite surfaces immediately surrounding the holes indicates that the holes were probably initiated by pitting (creating a rough surface) the position on both sides of the bead where the hole was intended (Figure 6). Pit marks are even visible around the holes of highly polished beads (Figure 7). The almost perfect roundness of some holes can be seen as strong indications for the use of drills. However, at this point in time the material of such drill bits cannot be deducted. What is interesting though is that it could be established that the objects used for pitting had sharp, triangular tips (Figure 8). Hard crystals, with trigonal crystal systems such as quartz crystals, may have been used to perform this function.

Figure 6. Jagged edges indicating that the holes were initiated by pitting

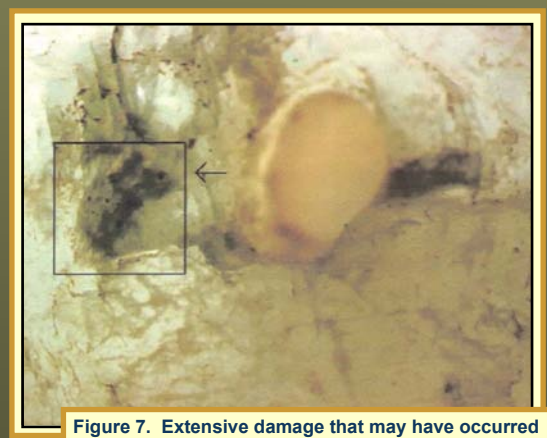

Figure 7. Extensive damage that may have occurred from the action of pitting

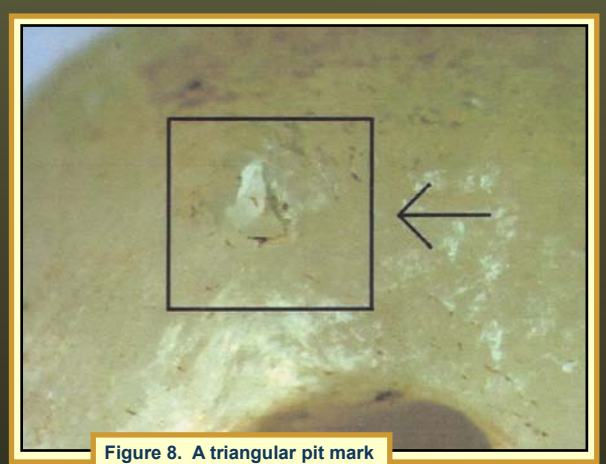

Figure 8. A triangular pit mark

Were the calcite crystal beads strung and worn?

There are clear indications that the beads were strung together with other beads or objects. The well-rounded edges of the holes, where the beads abraded against strings, are evidence of the yielding nature of the raw materials used to make the strings (Figure 9). The black circle in Figure 10 indicates the original drilled hole, while the enlargement was probably caused as a result of the bead having abraded against a string for a period of time. Evidence for the interpretation that the beads were strung together with other beads or pendants is the abrasion observed on the surfaces adjacent to the holes of some beads. The abrasion on the surface of this bead is limited to the same side as the enlargement of the hole, indicating the area where abrasion would naturally occur with adjacent objects on the same string.

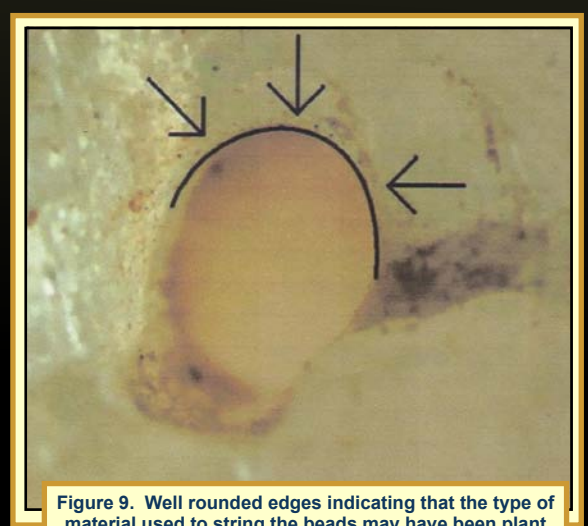

Figure 9. Well rounded edges indicating that the type of material used to string the beads may have been plant material

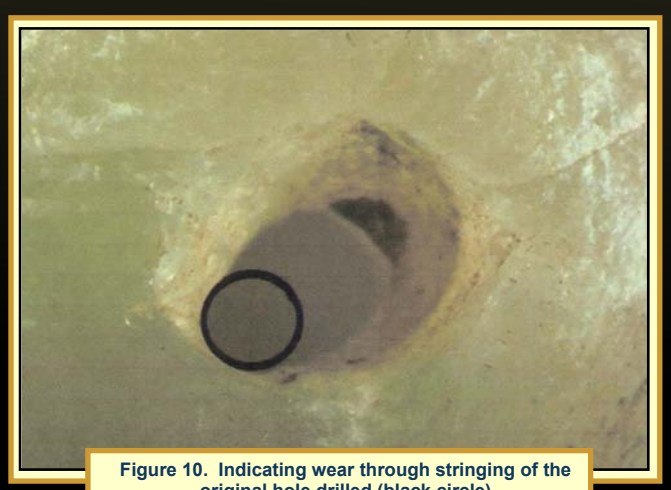

Figure 10. Indicating wear through stringing of the original hole drilled (black circle)

Discussion

It seems certain that calcite was collected in the form of crystals or aggregates of crystals and imported to Mapungubwe - they could not occur naturally on the hill itself. There aggregate was broken up and pieces selected for jewellery manufacturing. Some of these were rounded and smoothed in a symmetrical fashion and a hole was drilled for use as a decorative bead. Finishing and smoothing would preferably be done on less coarse material, an imported stone or even a piece of pottery to achieve a finer finish with less pitting and striation whilst removing some of the white streak. Evidence supporting this technique is suggested by the presence of differential rubbing marks as well as striations on a number of artefacts. The bead holes are remarkably smooth internally and on the outside edges (is this from the manufacturing process or rubbing of the string material/ acid weathering) indicating the possibility of the use of a drill.

References

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